PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-260245

(43)Date of publication of application : 25.09.2001

(51)Int.Cl. B29D 30/10

(21)Application number : 2001-023294

(22)Date of filing : 31.01.2001

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(30)Priority

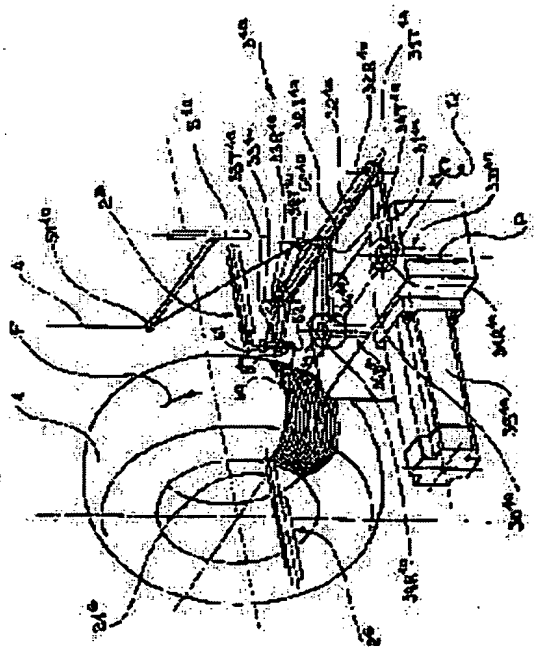
Priority number : 2000 200001393 Priority date : 01.02.2000 Priority country : FR

(54) RECIPROCATING ARM DEVICE FOR MANUFACTURING TIRE REINFORCEMENT FROM SINGLE CORD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method for manufacturing a reinforcement by molding on a cylindrical mold which is the same as or similar to the internal cavity for molding a tire, with such advantages that a wide range of tire sizes can be dealt with by making only a simple adjustment of the device and a production speed is high.

SOLUTION: In this molding method by which constituent cords 4 of a carcass reinforcement are mutually arranged archwise on a rigid core mold 1 by a, sequence of reciprocating motions of a guide member 6, the transfer means of the guide member 6 has at least a single base arm 31 having a rotational center 31R and a transfer head 31T and a control means which reciprocates the base arm 31 around the rotational center and it is arranged so that the geometric axis of the rotational center is completely outside the mold 1 at a working position.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]
[Claim 1] According to the locus of a request of the code (4) supplied through a feeder on an almost annular mold, arrange in the shape of an arch, and make tire reinforcing materials one by one. The interior material of a proposal which manufactures the tire reinforcing materials who collaborate with an almost annular mold and are used and which is equipment and Following a - the c:a code can slide freely (6), b) The migration means which is made to move said interior material of a proposal by periodic order movement, and carries the interior material of a proposal near each request edge in the locus of the above of a code one by one periodically, c) In the equipment which has press equipment (2) which forces a code (4) on the front face of a mold near [edge] each [of a locus] Equipment characterized by the following i and ii : At least one base arm on which i migration means has the center of rotation (31R) and a migration head (31T) (31), Having the control means which carries out reciprocation movement of this base arm by the periphery of that center of rotation, the migration head (31T) of a base arm carries the interior material of a proposal directly from the end section of the above-mentioned locus to the other end, or indirectly, and the geometrical axis of ii center of rotation is outside completely [a mold] in an active position.
[Claim 2] Equipment according to claim 1 with which the migration head (31T) of a base arm (31) supports the interior material of a proposal (6) directly.
[Claim 3] The center of rotation of the 2nd arm is attached in the migration head (31T) of a base arm. It has the 2nd arm (32) by which joint connection was made in the center of rotation (32R) of the 2nd arm which has the migration head (31T) to which the 2nd arm (32) carries the interior material of a proposal directly from the end section of a locus to the other end, or indirectly. Equipment according to claim 1 which has the control means which controls the relative position of the 2nd arm to a base arm (31).
[Claim 4] It is the manufacturing installation which collaborates with an almost annular mold, arranges in in the shape of an arch the code supplied through a feeder according to the request locus of a code on the front face of a mold, and carries out sequential creation of the tire reinforcing materials. Following : The interior material of a proposal which the a code can slide freely, and the migration means which is made to move the interior material of the b aforementioned proposal by periodic order movement, and carries the interior material of a proposal near each request edge in the locus of the above of a code one by one periodically, c) In the equipment which has press equipment (2) which forces a code (4) on the front face of a mold near [edge] each [of a locus] A migration means has at least two arms, a reciprocation base arm and other at least one reciprocation arm. These at least two arms have the center of rotation and a migration head, respectively. Geometric axis of rotation of two arms is mutually parallel, and it has further the control means which tells reciprocation movement centering on each geometric axis of rotation to each arm. The migration head of a base arm is equipment characterized by having the control means which supports the center of rotation of the 2nd reciprocation arm, carries the interior material of a proposal directly [a migration head] from the end section of a locus to the other end, or indirectly, and controls the relative position of the 2nd arm to a base arm.
[Claim 5] the control means which controls the relative position of the 2nd arm (32) to a base arm (31) --

the center of rotation of a base arm -- said -- the equipment according to claim 3 or 4 with which it has a **** drive pulley (311), and the angular position of this driving pulley is controlled independently, and, as for reciprocation control of a base arm, has the 2nd arm and an one follower pulley (312), and the synchronous belt (361) is hung on two pulleys.
[Claim 6] Equipment according to claim 5 with which the driving pulley (311) is being fixed in space.
[Claim 7] It has the 2nd arm (32) by which joint connection was made in the center of rotation (32R) of the 2nd arm. The center of rotation of the 2nd arm is attached in the migration head (31T) of a base arm (31). It has the migration head (32T) which carries the interior material of a proposal directly [the 2nd arm] from the end section of a locus to the other end, or indirectly. It has further the auxiliary arm (34) which reciprocates the surroundings of the center of rotation (34R). The geometric axis of rotation of the center of rotation of this auxiliary arm is located outside completely [the front face of a mold] between the front face of a mold, and the geometrical axis of rotation of said base arm. An auxiliary arm has a migration head (34T), and the 2nd arm has the middle center of rotation (32I) between the center of rotation (32R) of the 2nd arm, and the migration head (32T) of the 2nd arm. This middle center of rotation is equipment according to claim 1 by which joint connection is made at the migration head (34T) of an auxiliary arm.
[Claim 8] Equipment according to claim 3, 4, or 7 with which the migration head (32T) of the 2nd arm supports the interior material of a proposal (6) directly.
[Claim 9] Equipment given in any 1 term of claims 3-7 which have the 3rd arm (33) by which joint connection was made on the migration head (32T) of the 2nd arm through the center of rotation (33R), have the migration head (33T) which carries the interior material of a proposal directly [the 3rd arm] from the end section of a locus to the other end, or indirectly, and have the control means which controls the relative position of the 3rd arm to the 2nd arm.
[Claim 10] Equipment according to claim 9 with which the migration head (33T) of the 2nd arm supports the interior material of a proposal (6) directly.
[Claim 11] It has a **** drive pulley (321). the control means which controls the relative position of the 3rd arm to the 2nd arm -- fundamental -- the center of rotation (32R) of the 2nd arm -- said -- This driving pulley is claims 9 and 5 by which it is a base arm (31) and one, the center of rotation has the 3rd arm (33) and an one follower pulley (322), and the synchronous belt (362) is hung between the driving pulley and the follower pulley, or equipment given in 10 and 5.
[Claim 12] It has a **** drive pulley (321). the control means which controls the relative position of the 3rd arm to the 2nd arm -- fundamental -- the middle center of rotation (32I) of the 2nd arm -- said -- This driving pulley is claims 9 and 7 by which it is a middle arm (34) and one, the center of rotation has the 3rd arm (33) and an one follower pulley (322), and the synchronous belt (362) is hung on the driving pulley and the follower pulley, or equipment given in 10 and 7.
[Claim 13] It is equipment according to claim 9 or 10 which has the rack with which this connection rod engaged with the gearing the cam follower which collaborates with a cam in one side in the opposite side by having the cam by which the control means which controls the relative position of the 3rd arm to the 2nd arm has been arranged fundamentally at the migration head of a base arm, the 3rd arm and an one gearing, and the connection rod by which slide guidance is carried out to the 2nd arm.
[Claim 14] Equipment given in any 1 term of claims 1-13 which have the base material of a means which moves the interior material of a proposal, and have a means to tell mutual movement to this base material and to bend the locus of the code (4) on a heart type (1).

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of a tire, especially the configuration method of the code which constitutes tire reinforcing materials. Especially this invention relates to a means support a tire material at the time of tire manufacture to manufacture reinforcing materials mostly on a circular ring-like mold (mold which has a configuration similar to the same configuration or the same it as the internal cavity of a tire).
[Description of the Prior Art]
[0002] The approach and equipment which manufacture of tire reinforcing materials can build now into the assembly of the tire itself are already known for the technical field of this invention. That is, using half-finished products, such as reinforcement ply, at the time of tire manufacture, I hear that an unit or two or more reinforcing materials are manufactured on that spot, and it is [rather than] from a cord reel. The solution approach of a Europe patent [No. 0,580,055] publication conforms to the external surface manufacturing the carcass reinforcing materials who correspond substantially in the mold of the internal cavity of a completion tire among these approaches and equipment at a hard heart draw spike most. In this patent specification, it is attached in the shape of [the code for constituting carcass reinforcing materials adjoins a hard heart draw spike through guidance tubing fixed on the chain installed in the pulley] an arch, and the equipment which forms a kind of fork member and encloses a heart type is indicated. Guidance tubing exercises the heart type surroundings approximately, attaches one arch at a time by turns one by one respectively in the outward trip and return trip, forces the edge of said arch using suitable press equipment, and forms an arch in the hard heart draw spike by which preliminary covering was carried out with non-hardened rubber.
[0003]
[Problem(s) to be Solved by the Invention] The purpose of this invention is the same approach substantially, and is to offer the modification of the facility which arranges a reinforcement code to a heart draw spike.
[0004]
[Means for Solving the Problem] This invention is the manufacturing installation of the tire reinforcing materials who arrange the shape of an arch in on an almost annular mold for the code supplied if needed from a suitable feeder according to the request locus of a code, and do sequential creation of the tire reinforcing materials. The interior material of a proposal which Following a - the c:a code can slide freely, and the migration means which is made to move the interior material of the b aforementioned proposal by periodic order movement, and carries the interior material of a proposal near each request edge in the locus of the above of a code one by one periodically, c) In the equipment which has press equipment which forces a code on the front face of a mold near [edge] each [of a locus] the following -- : which offers the equipment characterized by i and ii -- i migration means with at least one base arm which has the center of rotation and a migration head It has the control means which carries out reciprocation movement of this base arm by the periphery of that center of rotation, the migration head

of a base arm carries the interior material of a proposal directly from the end section of the above-mentioned locus to the other end, or indirectly, and the geometrical axis of ii center of rotation is outside completely [a mold] in an active position.
[0005]
[Embodiment of the Invention] This invention equipment forms a loop formation, and since the press equipment which receives and forces this loop formation on a heart type is included, a publication can be referred to to the Europe patent application No. 0,580,055. Please remember that this press equipment consists of a fork member and a hammer fundamentally. The example of the press equipment of a Europe patent application [No. 0,580,055] publication can be used also for the new press equipment which sets aside 2 or 3 detailed parts and explains them below as it is. The main differences in this invention are in the drive approach of a code anchoring member and the interior material of a proposal (namely, guidance tubing) which a code can slide freely correctly. That is, a reciprocation arm system or a system given in the following is used instead of a chain system given in the above-mentioned patent.
[0006] Probably, it will be useful to remember some points, before explaining to a detail a new means of this invention to drive the interior material of a code proposal. He has to understand that it is not necessary to be including the cable or throwing in which the vocabulary a "code" has completely general semantics like the above-mentioned patent, and collection objects, such as single yarn and two or more yarn, for example, a cable, throwing, etc., and a fraction carried out grouping first even if the ingredient is arbitrary and preliminary covering of the "code" is carry out with rubber. The vocabulary an "arch" expresses with this specification a part of code of the reinforcing materials prolonged from one point to other points. All the arches arranged at the perimeter of a tire form the so-called reinforcement object. The arch of a definition here is good at a part of carcass, some reinforcing materials for treads, or some reinforcing materials of other arbitration formats. This arch is attached, may cut a code, and may be separated [it is the middle, and], and all may be connected in reinforcing materials through the loop formation.
[0007] In this invention, a reinforcement code is put in order continuously fundamentally and it is made the form possible nearest to the form of a finished product. A code is supplied if needed through suitable feeders, such as equipment which controls a cord reel and the tension of a code which will be pulled out from a reel if available. this invention equipment which manufactures reinforcing materials from this code collaborates with the mold (a hard heart type or the reinforced hard bladder) with which a tire is manufactured on it. It is not important whether it attaches in manufacturing perfect reinforcing materials, and a code is cut between two pass of two or more continuation pass of a member or it does not carry out.
[0008] When it expresses a location or a direction with the vocabulary "the radiation direction, the direction of an axis, and a circumferencial direction", or when it expresses a radius, the heart type or the tire itself from which a tire is made upwards becomes a reference point. The geometrical axis of criteria is the revolving shaft of a mold. Similarly, as already pointed out by the above-mentioned patent, the anchoring pitch of a code can be changed during the manufacture which manufactures reinforcing materials, for example, carcass reinforcing materials, by the code anchoring member of this invention. A "anchoring pitch" is a distance expressed with the sum of the space between two codes which adjoin mutually, and the diameter of a code. In the case of carcass reinforcing materials, it is known that the space between codes changes with a measurement radius. It wants to say here that a pitch changes not in this change but in a predetermined radius. What is necessary is just to change the rotational speed of a mold with the function of the suitable regulation of arbitration, without changing the rate of the interior material of a proposal for that purpose. The tire which was attached by it in the pitch controlled so that a carcass reinforcement code changed to the predetermined radiation direction location in the case of for example, the radial carcass is obtained.
[0009] This invention can be carried out in the various examples. Three main examples are shown below. In the 1st example, a series of three functional reciprocation arms are used. The modification over this 1st example is also indicated. As for these three functional reciprocation arms of a series of, it is desirable to use for arranging the carcass arch prolonged from one bead of a tire to the bead of another

side. In the 2nd example, a series of two functional reciprocation arms are used. The modification over this 2nd example is also indicated. As for these two functional reciprocation arms of a series of, it is desirable to use for arranging the carcass arch which extends to a shoulder from the bead of a tire. A single functional reciprocation arm is used in the 3rd example. This arm is enough to carry out simplest anchoring.

[0010] When arranging and using the functional reciprocation arm of a series of "n" individuals (n> 1), the vocabulary "the n-th arm" expresses the reciprocation arm to which the interior material of a code proposal is fixed directly, and a base arm is always the "1st reciprocation arm." Each reciprocation arm is arranged in the shape of a cascade, and, generally the migration head of a reciprocation arm "p" (it is p>n) supports the center of rotation of a reciprocation arm "p+1." It was said that a migration head carries out direct or "indirect" (minding unit or reciprocation arm [**** / everything but plurality]) support of the interior material of a code proposal because [this]. The geometric center-of-rotation shaft of the 1st reciprocation arm is [no] outside completely [a mold] in an activity location in the examples, and this medial axis never contacts a mold (contact is not carried out on that production, either).

[0011] The code guide apparatus of this invention equipment draws a movement side perpendicular to the geometric revolving shaft of movement, i.e., a base arm, substantially included at a flat surface. The reciprocation arm used in a base arm or the modification in other viewpoints of this invention equipment is a long flat surface, and the flat surface where one of the flat surfaces which the movement side of base arm ** is reciprocated, or all reciprocation arms carry out a parallel displacement, or adjoin becomes very close to this movement side, or it moves is joined.

[0012] In another viewpoint of this invention, it says without taking into consideration each location to the mold of a series of reciprocation arms, and this invention offers the tire reinforcing materials manufacturing installation which has a series of arms by which joint connection was perpendicularly made to the movement side. It collaborates with an almost annular mold, the reinforcing materials who consist of the code continuously supplied if needed from a suitable feeder are used, and this equipment manufactures him. This equipment moves the interior material of a proposal which the :a code can slide freely, and the interior material of the b aforementioned proposal by periodic order movement, and has press equipment (2) which forces a code (4) on the front face of a mold the migration means which carries the interior material of a proposal near each request edge in the locus of the above of a code one by one periodically, and near [edge] each [of c locus]. As for the description of this invention, a migration means has at least two arms, a reciprocation base arm and other at least one reciprocation arm. These at least two arms have the center of rotation and a migration head, respectively. Geometric axis of rotation of two arms is mutually parallel, and it has further the control means which tells reciprocation movement centering on each geometric axis of rotation to each arm. The migration head of a base arm supports the center of rotation of the 2nd reciprocation arm, carries the interior material of a proposal directly [a migration head] from the end section of a locus to the other end, or indirectly, and is in a point equipped with the control means which controls the relative position of the 2nd arm to a base arm. He can understand all the above-mentioned viewpoints of this invention from explanation of the following which referred to the accompanying drawing. In addition, this invention is not limited to the following example.

[0013]

[Example] Drawing 1 shows that a mold (forme) is hard heart type 1 which can be detached and attached and which specifies a tire inside configuration. However, it is not limited to this. This heart type 1 is covered with the rubber layer for holding certainly the rubber layer 10 (referring to drawing 7), for example, the seal rubber layer which used isobutylene isoprene rubber as the base, and a carcass code. The code 4 arranged on heart type 1 is held according to the adhesion effectiveness of this rubber layer 10 that covers heart type 1. Making it rotate with the equipment of the arbitration which is not illustrated can understand heart type 1.

[0014] An anchoring member consists of reciprocation arm system 31a, and press equipment 2G and 2D fundamentally. In addition, the same main reference number is attached to a similar member (for

example, "3" be attached to a reciprocation arm system), and the example and modification attach a characteristic and are expressed with the reference number of drawing (for example, "1a" is attached to the modification "a" of the 1st example). The reference number without a specific characteristic is the always same member in each modification, or shows the thing common to all examples and modifications.

[0015] In the 1st example shown in drawing 1 , reciprocation arm system 31a has three functional reciprocation arms 311a, 321a, and 331a arranged in the shape of a cascade, and auxiliary arm 341a. The interior material of a proposal of a code 4 can be easily moved to the bead of another side from one bead, and this invention equipment can be made to exercise together with press equipment 2G and 2D in each bead according to this structure of having three reciprocation arms, in this invention. Although the interior material of a code proposal is the guidance tubing (oeilleton, eyelet) 6 in all the examples, it is not limited to this. This guidance tubing 6 is attached in the last reciprocation arm 33. Before giving detailed explanation, it is said briefly that this reciprocation arm system 3 is positioned by the suitable approach so that the duty same [said Europe patent / No. 0,580,055] as the chain system of a publication may be carried out and press equipment 2G and 2D may carry out [this Europe patent / No. 0,580,055] the role of a publication.

[0016] Reciprocation arm system 31a is attached on plate 301a, and makes movement (movement which turns around the surroundings of heart type 1 in many the examples) which passes through the upper part of heart type 1 in the guidance tubing 6 draw. The reciprocation arm system 3 makes the guidance tubing 6 exercise in one field in all the illustrated examples. The guidance tubing 6 is carrying out the funnel shape, the side which a code 4 reaches has the big opening 61, and the side which a code 4 leaves has become a stoma 62 (also see drawing 3). This stoma 62 carries out movement in the above-mentioned field of the interior material 6 of a proposal. Since the outlet part of this stoma 62 is mostly arranged in a movement side (inside of a field perpendicular to the guidance direction of the guidance tubing 6), it processes the edge of a stoma 62 carefully and it is made not to attach a blemish to a code 4 generally. SEYOTO [a modification / the sense near the average sense of the code at the time of leaving guidance tubing / guidance tubing].

[0017] Plate 301a is equipped with reciprocation shaft 3D1a (see drawing 10 and drawing 11 R> 1) which carries out motorised [of the reciprocation arm system]. The geometrical axis of this reciprocation shaft 3D1a is on the outside radiation of heart type 1. If it puts in another way, the production of the geometrical axis of reciprocation shaft 3D1a does not contact heart type 1, but is located in the outside of the front face of heart type 1. Continuous rotation of the reciprocation shaft 3D1a is not carried out, but it carries out reciprocation movement at the predetermined radii include angle of 360 degrees or less. The value with this exact radii include angle is decided by the exact configuration of the reciprocation arm system 3, and its purpose of use.

[0018] The reciprocation arm system 3 is very compact. The aggregate of the anchoring member which contains press equipment 2, a motor, and a drive in this reciprocation arm system 3 forms a subassembly. By the easy approach, this subassembly can approach a heart type, can retreat it, and to a heart type, can approach and can retreat other equipments (for example, equipment moved to the equipment for tire manufacture, and other stations of tire manufacture of a heart type).

[0019] 1st arm (base arm) 311a is attached in reciprocation shaft 3D1a in the place of center-of-rotation 31R1a (drawing 1). This 1st arm 311a has migration head 31T1a at the opposite side edge of center-of-rotation 31R1a. Center-of-rotation 32R1a by which joint connection of the 2nd arm 321a was made is attached in migration head 31T1of 1st arm 311a a. This 2nd arm 321a has migration head 32T1a. In order to control the relative position of 2nd arm 321a to 1st arm 311a, in this example, auxiliary arm 341a which forms a parallelogram is used. Center-of-rotation 34R1of this auxiliary arm 341a a is attached in reciprocation shaft 34D1a, and reciprocates. From the front face of heart type 1, center-of-rotation 34R1a is the radiation direction outside, and is located on the radiation between the front face of heart type 1, and center-of-rotation 31R1of 1st arm 311a a. Auxiliary arm 341a has migration head 34T1a by which joint connection was made in 2nd arm 321a, and the 2nd arm has middle center-of-rotation 32I1a at this edge. This center-of-rotation 32I1a is located between center-of-rotation 32R1of

2nd arm 321a a, and migration head 32T1a.
[0020] It must be cautious of the singular point when center-of-rotation 31R1a, 34R1a and migration head 31T1a, and 34T1a exist not forming a parallelogram. For these points, the center position specified with the axis MM which connects center-of-rotation 31R1a and 34R1a, and the geometrical axis (and geometrical axis of shaft 34D1a parallel to this) of shaft 3D is a longitudinal plane of symmetry (plan median). In case it passes, it is desirable to have consistency correctly mutually. That is, the locus of movement of the guidance tubing 6 becomes the symmetry to a longitudinal plane of symmetry, and guidance tubing carries out completely symmetrical movement also near each bead field where it was specified on heart type 1. However, that it is not what is excepted (for example, when the locus of an arch manufactures the tire which is not symmetrical) can understand the case where this does not become the symmetry to a longitudinal plane of symmetry at the terminal point of movement of guidance tubing. This corresponds, when manufacturing the tire from which the diameter of the anchoring section (attaching in the general vocabulary bead) of each bead differs.
[0021] This invention equipment has 3rd arm 331a, and joint connection of the center-of-rotation 33R1of this 3rd arm 331a a is made at migration head 32T1of 2nd arm 321a a. 3rd arm 331a has migration head 33T1a, and the guidance tubing 6 is directly attached in this migration head 33T1a. The control means (in order not to complicate drawing, not shown in drawing 1) of the relative position of 3rd arm 331a to 2nd arm 321a is explained below using drawing 5 . saying [that the migration edge which supported the guidance tubing 6 directly by using the 3rd movable reciprocation arm to the 2nd reciprocation arm here can be made to approach a bead], if it puts in another way It is only said that movement accessed to the field hidden with the wall to the observation direction of the radiation direction involving the surroundings of the wall of heart type 1 to the center of rotation of the 1st arm is helped. Moreover, since 3rd arm 331a has turned to the predetermined direction to 2nd arm 321a, it can be understood well that the degree of freedom of the function between each arm is large.
[0022] It is desirable for motor 351a to carry out motorised [of two shaft 3D1a and the 34D1a] to drawing 10 and drawing 11 , as shown in a detail, and to control movement of all the arms 311a, 321a, 331a, and 341a. Motor 351a rotates a disk 70. The shaft 71 is attached in the eccentric predetermined location of this disk 70. This shaft 71 is supporting the roller 72. Carriage 73 moves in the direction of an axis on the slide 74 formed in casing of plate 301a. Carriage 73 has the straight-line-like slot 75 which turned to the right-angled direction to the movement-before and after carriage 73 on slide 74 direction. The chain (with a tender) 76 is rolled on the two same pinions 77, and has connected the both ends to carriage 73. Each pinion 77 is being fixed to shaft 3D and shaft 34D.
[0023] If a motor 35 carries out the rotation drive of the control shaft 71 with constant speed, a roller 72 will carry out circular-motion 70R with constant speed. Consequently, a roller 72 moves the inside of a slot 75 up and down, and moves carriage 73 to shaft orientations. That is, rotation of constant speed is changed into the mutual rectilinear motion from which a rate changes to a sinusoidal form. This mutual rectilinear motion is changed into a chain 76 and reciprocation movement which draws the arc 360 degrees or less of shaft 3D and 34D through the two same pinions 77 mutually. The amplitude of this reciprocation movement can be adjusted by adjusting the eccentric radius of the shaft 71 (therefore, roller 72) on a disk 70. It is also possible to put the control law of arbitration peculiar to rotation of Rota of a motor 35 on this mechanical movement transformation method rule.
[0024] If it returns to explanation of drawing 1 , a code 4 will be supplied through reel (not shown) and feeder 51a. A code 4 attaches feeder 51a and it is correctly supplied to a member. Since a code 4 is attached at the rate (it may become a negative rate) which changes periodically and is pulled out by the member, feeder 51a controls the tension of a code 4, and when required, it has the means which attaches and carries out compensation between member 31a and a reel. A code 4 passes along 1st ring 511a. The guidance tubing 6 separates a few from the movement side which carries out periodic motion, and this 1st ring 511a is arranged right in the middle to heart type 1. Subsequently, a code 4 passes along the ring 52 fixed to 2nd arm 321a.
[0025] Furthermore, a code 4 passes along the guidance tubing 6. To the bead of another side, the guidance tubing 6 reciprocates from one bead to accuracy more in the location near the bead of the

location near one bead to another side. It is in the condition of having made one code contacting enough time amount molds. the basic cycle of this invention -- following phase: -- guidance tubing (interior material of a proposal) is moved to the 1st edge in the movement side of guidance tubing -- making -- 2, where a code is pressed in a mold at this 1st edge Where it held the code with time amount press equipment sufficient at least, it repeated the 1st step to the 2nd edge toward three opposite directions and a code is pressed in a mold at the 4 2nd edge It has ** which holds a code with another press equipment, and a mold is moved synchronizing with movement of the interior material of a proposal, and the above-mentioned basic cycle is repeated until the arch of the code 4 of the number of requests is arranged along with a desired locus on the front face of a mold.

[0026] Drawing 2 shows press equipment 2D. This press equipment 2D has fork member 21D and hammer 22D, and these move between the retreat location R (location distant from heart type 1), and the advance locations A. The broken line has shown the hammer of an advance location. Since the main reference number ("21") is attached to each part material of press equipment and the specific location (drawing 1 left-hand side or right-hand side) of press equipment is expressed with the reference number of drawing, a characteristic "G" (left) or "D" (right) has been attached . [as opposed to / For example, / a fork member] The reference number without a specific characteristic expresses the case where press equipment may be in ** and others or a side, and the case of being general.

[0027] Please refer to explanation of the aforementioned Europe patent No. 0,580,055 about each function of a fork member and a hammer 22. Each duty in the advance location A and the retreat location R is indicated by this patent. He can understand that the fork member 21 and the hammer 22 have the form of an parallel blade from drawing 2 . The fork member 21 is always arranged in the radiation direction to the hammer at the revolving-shaft side of heart type 1. The fork member 21 has the V character mold head 210, in order to hold a code 4 at the core. In the case of ******, the field formed by "V" is arranged at right angles to a code 4 in a code 4. When a code 4 must be arranged in the radiation direction (in the case of drawing 1), the blade which forms the fork member 21 has turned [****** / heart type 1 and / this] to the direction which carries out a tangent. The fork member 21 is dented and has 211. This duty is explained below.

[0028] It can understand the fork member 21 that it is what carries a code 4 toward heart type 1. Therefore, the forward motion of the fork member which goes to heart type 1 is started when the guidance tubing 6 leads a code 4 to one edge of the order movement (namely, when this invention equipment becomes the form of drawing 4 mostly). Movement of the fork member 21 stops, when a fork member fixes a code 4 to the rubber which has covered heart type 1. Therefore, the fork member 21 can paste up a code 4 on a request location correctly by sufficient force. If it returns to drawing 1 and the reciprocation arm system 3 continues movement, heart type 1 will rotate in a desired anchoring pitch (this is the function of rotation of heart type 1 notionally shown by the arrow head F), a loop formation will be formed in the surroundings at the tip 212 of the fork member 21, and movement which attaches the arch 40 of the new code 4 on heart type 1 will start (refer to drawing 1). The above-mentioned depression 211 enables it to let the guidance tubing 6 pass exceeding the fork member 21 all over a return phase (for the fork member 21 to be in contact with heart type 1 in this phase). That it is the function of the dimension at a tip 212 can understand the magnitude of a loop formation.

[0029] A hammer 22 operates, after the fork member 21 operates behind the return phase of the guidance tubing 6. A hammer 22 presses a code 4 in the slightly high location of the radiation direction. While the fork member 21 retreats, as for a hammer 22, it is desirable to hold the code 4. That is, while a fork member retreats, it can prevent that the loop formation of the code 4 formed in the surroundings at the tip 212 of the fork member 21 is carried together with the fork member 21 by holding a code 4 with a hammer 22 (a code 4 tends to paste a fork member, even when rubber is pasted). A code 4 is certainly fixable to a bead with this (support).

[0030] It can fall ill that migration in the advance location of the fork member 21 and hammer 22 which synchronize with reciprocation arm system 31a, and return movement to a retreat location are controlled by the suitable equipment of arbitration. For example, return movement of shaft 3D is controlled using the equipment which synchronizes electrically the mechanical gear or two or more motors using a belt or

a cable. In the following drawings, an arrow head only shows notionally the thing equivalent to this equipment or it, and it expresses with a reference number 2. Expressing with a code 4 the whole two right-hand-sides material of the fork member which carries out a sequential operation, and a hammer generally can understand this.

[0031] Drawing 3 shows the modification of the 1st example which has reciprocation arm system 31b, and these reciprocation arm system 31b differs as fundamentally [a means to control movement of 2nd arm 321b to 1st arm (base arm) 311b] as said reciprocation arm. Having three functional arms 311b, 321b, and 331b by which arm system 31b of this modification of the 1st example has also been arranged in the shape of a cascade, by the above-mentioned control means, it operates from one bead to the bead of another side, and these arms function together with press equipment. 1st arm (base arm) 311b is attached in reciprocation shaft 3D1b through center-of-rotation 31R1b. 1st arm 311b has migration head 31T1b at the edge of the opposite side with the above-mentioned center-of-rotation 31R1b. 2nd arm 321b by which joint connection was made is attached in center-of-rotation 32R1b of the 2nd arm at migration head 31T1of 1st arm 311b b. This 2nd arm 321b has migration head 32T1b. With this invention equipment, 3rd arm 331b by which joint connection was made is in migration head 32T1of 2nd arm 321b b through center-of-rotation 33R1b. This 3rd arm 331b has migration head 33T1b, and the guidance tubing 6 is directly attached in this migration head.

[0032] Driving pulley 3111b is center-of-rotation 31R1b of the 1st arm, and this alignment, and is united with flange 371b fixed to the aforementioned plate (not shown to drawing 3). Follower pulley 3121b is 2nd arm 321b and one (there is no relative rotation). It connects by synchronous belt 3611b between these driving pulleys and follower pulleys. The diameter of a driving pulley and a follower pulley is the same, and 2nd arm 321b is always parallel to these pulleys during the movement. In order to decide the location of each arm correctly, it can be understood to this contractor that a pulley with a gear tooth must be used. It is made the belt with a gear tooth which can exercise without carrying out a relative slide to the pulley with which a belt also corresponds. That is, connecting using the equipment of arbitration without slipping, such as a chain and a pinion, can understand each arm which should control a location. On these specifications, the vocabulary a "pulley" and a "belt" means all the systems that can slide on a relative position and can be controlled nothing.

[0033] Although flange 371b is standing it still spatially in this example, generally it is important for control of reciprocation movement of the 1st arm to control the angular position of this flange independently. For example, a degree of freedom can be given to movement between the above-mentioned plate and flange 371b, the relative position of flange 371b to a plate can be controlled, the spatial position of driving pulley 3111b can be alternatively controlled by it, and the guidance tubing 6 can be made to exercise according to the mold with which dimensions differ.

[0034] A means to control the relative position to 2nd arm 321of 3rd arm 331b b is center-of-rotation 32R1b and this alignment of 2nd arm 321b, and consists of 1st arm 311b, one driving pulley (relative rotation is impossible) 3211b, and 3rd arm 331b and one follower (relative rotation is impossible) pulley 3221b. Synchronous belt 3621b is applied among these driving pulleys and follower pulleys. The diameter of a driving pulley and a follower pulley calculates the value of each diameter so that migration edge 33T1b can approach the field near the bead of heart type 1 (refer to drawing 4), without differing mutually and 2nd arm 321b's colliding with the sidewall 11 of heart type 1 during movement.

[0035] Drawing 4 shows the condition of the guidance tubing 6 in each location 6 (a) which this invention equipment occupies in the end section of order movement of the reciprocation arms 311b, 321b, and 331b. 321b (a) and 331b (b) have shown the corresponding arrangement which the 2nd arm and the 3rd arm occupy, respectively. The difference between a location and arrangement is expressed with reference characters (b), (c), and (d).

[0036] In the modification, driving pulley 3211b can be freely installed to 1st arm 311b, and it can also drive independently of both movement of the 1st arm, and movement of pulley 3111b by driving by the belt twisted around the pulley (not shown) of an and also [it is driving pulley 3211b, one one pulley, geometrical axis 3D1b, and this alignment]. The degree of freedom of control of the relative motion of the 3rd arm to the 2nd arm becomes large by this.

[0037] Drawing 5 expresses it and the equal control means which are attached in reciprocation arm system 31a of drawing 1 . Middle arm 341a, one 3rd (relative rotation is impossible) pulley 3211a, and 3rd arm 331a and one 4th (relative rotation is impossible) pulley 3221a are shown in this drawing by middle center-of-rotation 32I1a and this alignment of 2nd arm 321a. Synchronous belt 3621a is hung on these driving pulleys and follower pulleys. The diameter of a driving pulley and a follower pulley calculates the value of a diameter so that migration edge 33T1a may arrive at the field near the bead of heart type 1 (refer to drawing 4), without differing mutually and 2nd arm 321a's colliding with the sidewall 11 of heart type 1 during movement of a pulley. The above-mentioned explanation about other approaches of controlling the relative motion of the 3rd arm to the 2nd arm is applicable also to this modification.

[0038] Be careful about other details shown in drawing 5 . In this drawing, as arm system 31a is mostly shown by drawing 1 , it is arranged. By this arrangement, 2nd arm 321a is installed in one side (one side of the longitudinal plane of symmetry specified by Axis MM and the geometrical axis of shaft 3D1a) of 1st arm 311a and middle arm 341a, and the guidance tubing 6 remains in the same side as it, while exercising the one half top of heart type 1 located in one of this longitudinal-plane-of-symmetry side. In case 2nd arm 321a moves to an another side side from one heart type side, it goes to the opposite side of a longitudinal plane of symmetry, and 1st arm 311a and middle arm 341a also go to the opposite side at the time of this passage. Middle arm 341a passes through a 1st arm 311a top during this same movement. Therefore, it is important to enable this movement for an arm in piles correctly. Therefore, spacer sleeves 3811a and 3821a are formed. This is a general thing, and when making joint connection of the reciprocation arm of each other and carrying out symmetry movement to a longitudinal plane of symmetry, each arm laps mutually and it must be able to be made to perform a desired crossover.

[0039] Drawing 6 and drawing 7 show the modification of further others of the 1st example. The approaches of control movement of this modification of 3rd arm 331c differ. Arm system 31c has three functional arms 311c, 321c, and 331c arranged in the shape of a cascade also in the modification of this 1st example, and this invention equipment exercises from one bead to the bead of another side by the above-mentioned control means.

[0040] Since the relative motion of 1st arm (base arm) 311c and 2nd arm 321c which are shown in drawing 6 and drawing 7 is the same as what was explained by the arm systems 31a or 31b, explanation is omitted. 1st arm 311c has migration head 31T1c, and 2nd arm 321c by which joint connection was made at center-of-rotation 32R1c of the 2nd arm is attached in migration head 31T1of 1st arm 311c c. This 2nd arm 321c has migration head 32T1c. In this example, it has 3rd arm 331c by which joint connection was made through the center of rotation 33R13 at migration head 32T1of 2nd arm 321c c. This 3rd arm 331c has migration head 33T1c, and the guidance tubing 6 is directly attached in this migration head. Cam 3811c is machined by migration head 33T1of 1st arm 311c c. This cam 3811c has last control-section 381A1c which the radius which controls the relative motion of 3rd arm 331c by one [381N1of neutral partial c machined by the fixed average radius and] heart type side increases, and last control-section 381B1c to which the radius which controls the relative motion of 3rd arm 331c by the heart type opposite side decreases. Gearing 3221c is installed in center-of-rotation 33R1of 3rd arm 331c c. This gearing 3221c is 3rd arm 331c and one (relative rotation is impossible). Connection rod 3831c slides the inside of 2nd arm 321c and one guidance 3841c. That is, connection rod 3831c is guided so that it may slide to 2nd arm 321c. Connection rod 3831c supports cam follower 3821c which collaborates with cam 3811c in one side. Connection rod 3831c has rack 3851c which engages with gearing 3221c in the opposite side of cam follower 3821c. The profile of the cam of last control-section 381A1c and 381B1c is chosen, and it is made for the guidance tubing 6 attached in migration edge 33T1of 3rd arm 331c c without 2nd arm 321c's colliding with the sidewall of heart type 1 during movement of 3rd arm 331c to arrive at the field near the bead of heart type 1 (to refer to location 6of drawing 7 a).

[0041] Drawing 7 shows the condition of the guidance tubing 6 in the location 6 (a') given by the cam mechanism in one edge of order movement of the reciprocation arms 311c, 321c, and 331c. 321c (a') and 331c (a') have shown the corresponding location which the 2nd arm and the 3rd arm occupy,

respectively. Other locations and arrangement are expressed with reference characters (b'), (c'), and (d'). When drawing 4 is compared with drawing 7 , and (a) and (a') the expressed location are the same, it turns out that the location which is drawing 7 (b') and was displayed by (c') and (d') differs from the location (b) of drawing 4 , (c), and (d) a little. The comparatively big play maintained and permitted by the cam control means in the place of the height of a sidewall 11 is seen.

[0042] In cam control, since relative motion is substantially dependent on the profile of a cam, the relative motion between the 2nd arm and the 3rd arm can be chosen quite freely along with a demand. Therefore, constraint of the proportionality about relative rotation between the 1st arm and the 2nd arm peculiar to the belt control explained with reference to drawing 3 and drawing 5 is removed. It becomes possible to decide the relative position of the 3rd arm to the 2nd arm so that the guidance tubing 6 may be especially opened quickly from heart type 1. That is, sufficient fixed play is securable between migration head 33T1c and heart type 1 (refer to locations 6b and 6c and 6d), exercising sufficiently near the front face of heart type 1 in a bead field (refer to location 6a). In case partial 381D1c which turns to partial 381B1c and other directions by cam 3811c gives a mere change (rapid change of a location) of a location remarkable at short distance (curvilinear x directional movement in alignment with cam 3811c) and approaches each bead, he can understand that a cam makes 3rd arm 331c rock at each one side of the 2nd edge in the both ends of movement of the guidance tubing 6.

[0043] In the 2nd example shown in drawing 8 and drawing 9 , reciprocation arm system 32a has the functional reciprocation arms 312a and 322a of the shape of two cascade. This example is designed movement from a bead to a shoulder, for example, for manufacture of a single-sided carcass. That is, the radial-ply tire which has been interrupted by somewhere in treads, without a carcass continuing from one bead to the bead of another side, and transmits the force between both-sides carcasses by belt reinforcing materials is known. The carcass reinforcing materials in this case must be stationed between a bead and a shoulder. The above-mentioned reciprocation arm system 32a uses the principle of the parallelogram used by the aforementioned reciprocation arm system 31a except for there being no 3rd arm. Plate 302a supports control-motor 352a, control-motor 352a drives shaft 3D2a and 34D2a, and axis of rotation of these shafts is contained in longitudinal-plane-of-symmetry M2 a-M2a. Control-motor 352a also drives press equipment 2G and 2D. These press equipments are the things of the same mold as what was explained to the detail by drawing 2 . Spacing of press equipment 2G to longitudinal-plane-of-symmetry M2 a-M2a and 2D can be adjusted by Handles 232a and 242a.

[0044] 1st arm (base arm) 312a is attached in reciprocation shaft 3D2a through the center-of-rotation 31R2a. If the radiation core C of heart type 1 is taken as a reference point, center-of-rotation 31R2a is located outside the front face of heart type 1. 1st arm 312a has migration head 31T2a, and 2nd arm 322a by which joint connection was made at center-of-rotation 32R2a of the 2nd arm is attached in migration head 31T2of 1st arm 312a a. This 2nd arm 322a has migration head 32T2a. In order to control the relative position of 2nd arm 322a to 1st arm 312a, in this example, the parallelogram is formed using auxiliary arm 342a attached so that the surroundings of reciprocation shaft 34D2a might be reciprocated through center-of-rotation 34R2a. When the radiation core C of heart type 1 is made into a reference point, center-of-rotation 31R2a is located on the outside of the front face of heart type 1 between the front face of heart type 1, and center-of-rotation 31R2of 1st arm 312a a. Auxiliary arm 342a has migration head 34T2a by which joint connection was made in 2nd arm 322a, and the 2nd arm has middle center-of-rotation 32I2a located between center-of-rotation 32R2of 2nd arm 322a a, and migration head 32T2a. The guidance tubing 6 is directly supported by migration head 32T2of 2nd arm 322a a. Orbital 632a has shown movement of the guidance tubing 6. This equipment that has two reciprocation arms can be used for movement to the point of the arbitration of the tread bottom which contains the shoulder of the opposite side from a bead, and can arrange a code in the condition of having overlapped partially with each single-sided carcass.

[0045] Drawing 9 shows the modification which has reciprocation arm system 32b from which the control means of movement of 2nd arm 322b [as opposed to 1st arm (base arm) 312b in what was explained by the system of drawing 8] differs. This modification has drive-pinion 3112b which has a pulley with a gear tooth, and a belt and which puts a core on center-of-rotation 31R2b of the 1st arm

instead of a control means.
[0046] Drawing 9 shows 1st arm (base arm) 312b attached in the reciprocation shaft through center-of-rotation 31R2b. 1st arm 312b has migration head 31T 2b in the opposite side of center-of-rotation 31R2b, and 2nd arm 322b by which joint connection was made at center-of-rotation 32R2b of the 2nd arm is attached in migration head 31T 2b of 1st arm 312b. This 2nd arm 322b has migration head 32T 2b, and the guidance tubing 6 is directly attached in this. Drive-pinion 3112b is united with flange 372b fixed to the plate (not shown to drawing 9). Follower pinion 3122b is united with 2nd arm 322b (relative rotation is impossible). Chain 3612b is hung between the 1st pinion and the 2nd pinion. The diameter of the 1st pinion and the 2nd pinion is the same, and 2nd arm 322b is always parallel to each pinion during movement. Reciprocation arm system 32b is also replaceable with reciprocation arm system 32a of drawing 8 . The aforementioned explanation about possibility of controlling the degree of freedom between a plate and flange 371b, and controlling the relative position of flange 371b to a plate is applied to this flange 372b and all similar flanges.
[0047] Don't forget for the guidance tubing 6 to exercise periodically the inside of the flat surface called a "movement side" in all the modifications. Moreover, the dimension of the field where the reinforcement code 4 is arranged for the field where preliminary covering of heart type 1 was carried out is determined. Furthermore, while the guidance tubing 6 carries out order movement in the movement side of guidance tubing, heart type 1 revolves around the axis. Of course, this movement of heart type 1 synchronizes with movement before and after guidance tubing. The true locus of the arch 40 of a code 4 is the function of the movement side of guidance tubing, and a heart type relative position, and is the function of the relative motion of heart type 1 and movement before and after the guidance tubing 6.
[0048] Although the locus of an arch 40 is a radial in drawing 1 , and 4, 7 and 8 mostly since drawing 1 , and 4, 7 and 8 are for the carcass (or carcass part) manufacture for radial-ply tires, of course, it is not limited to this. Other examples are shown in the 3rd example expressed to drawing 12 . Generally in drawing 12 , the locus of arch 403a has accomplished the include angle (about 15 degrees - 30 degrees) not to a radial but to belt reinforcing materials.
[0049] The 3rd example shown in drawing 12 has single reciprocation arm (base arm) 313a, this is suitable for manufacture of the reinforcing materials in the belt of a tire, and this system fits movement from the shoulder for manufacturing for example, belt reinforcing materials to a shoulder. Base arm 313a is attached in the reciprocation shaft through the center-of-rotation 31R3a. Base arm 313a has migration head 31 T3a, and the guidance tubing 6 is directly attached in this. If the movement side where the guidance tubing 6 exercises approximately is said according to the general practice for measuring an include angle in the tire field, it will accomplish the include angle of about 20 degrees to a field perpendicular to axis of rotation of heart type 1. Press equipment 2G and 2D also exercise in the same movement side. Although the code 4 passes along hollow core 513of reciprocation shaft 3D3a a by the example shown in drawing 12 and big code compensatory-system 523a is prepared in the upstream, it is not a limited ****** thing at this example.
[0050] Since the carcass which has cross ply in a sidewall is manufactured, an axis parallel to the revolving shaft of heart type 1 is made for the base material (plate 30 grade) of a code anchoring member to incline as a core, and the movement side of guidance tubing can also be changed from [entire] radiation. It is also possible to combine the aforementioned preparation explained by manufacture of ****** and belt reinforcing materials. A heart type can also be sharply driven at high speed (one eighth of rotations [as opposed to / For example, / movement before and after the reciprocation arm system 3]) so that the code arrangement include angle of the function of the rate of a chain and a heart type rate may be obtained without changing the description of the member of above equipment at all (in all the above-mentioned examples, the rate of heart type 1 be related only to an arrangement pitch).
[0051] Hereafter, although still more nearly another modification is explained, these are applicable to all the modifications of all examples given in this specification. Mutual movement can be given to the base material (refer to drawing 1 for plate 301a etc.) of a code anchoring member in order to change the anchoring locus of the code 4 on heart type 1. For example, it drives so that the direction of axis mutual

movement (refer to double arrow-head [of drawing 1] P) of the base material of an anchoring member may be carried out, and the direction movement of an axis of the movement side of guidance tubing can be carried out in the direction perpendicular to a movement side. The thing which drive so that reciprocation movement (movement which is included in a movement side and intersects geometrical axis of rotation (refer to surrounding arrow-head [double] Q of axial M-M of drawing 1) of a base arm) of the anchoring member base material may be carried out a core [a perpendicular geometrical axis] on the surface of a mold, and centers a movement side on an axis parallel to a movement side and to do for reciprocation movement is also possible. It is also possible to drive the base material of a code anchoring member so that reciprocation movement may be carried out a core [the axis of arbitration parallel to the base material of a code anchoring member]. It is important for this design to distinguish a plate one a30 from adjustment (for this to be possible in a case of a certain kind, and to be useful to it) of the fixed include angle centering on Axis MM. All of these specific examples give a still bigger degree of freedom to the form of the locus of a code 4 itself.

[0052] The advantage of this invention simplifies the device of equipment in which a well-known basic method is enforced conventionally, and it is in the ability to suit that it can be made light and the modification of all the tire reinforcing materials that cover the wide range tire which should be manufactured only by easy adjustment. The reciprocation arm system of this invention does not have a cantilever part, does not almost have an inertia part, and is suitable for gathering an operating speed. Carcass reinforcing materials can also be manufactured with the pass (each pass covers the whole heart type) of plurality (n). When arranging a radial arch with one pass in a pitch P, the location on heart type 1 of the arch 40 arranged with a series of n pass is shifted to a circumferencial direction with the phase corresponding to P/n. This contractor could use this invention by various approaches according to the request structure of a tire.

[0053] When manufacturing a single-sided carcass, each single-sided carcass can be manufactured to coincidence on heart type both sides by forming this invention equipment in each (drawing 8 , drawing 9 referring-to), and heart type one side. It is also possible to carry out sequential manufacture of each piece of a single-sided carcass. the locus of an arch has one advantage of this invention in the ability of the profile of a mold to be imitated by two or more use including ** which accomplishes a very different include angle (for example, about 20 degrees) in 90 degrees. It is possible to amount to a series of two points of the mold which is in each field to which a tire bead corresponds without colliding with a mold also in this case.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The notional perspective view showing the 1st example of this invention equipment.
[Drawing 2] Detail drawing of the press equipment of the above-mentioned equipment.
[Drawing 3] Drawing showing the 1st modification of the 1st example.
[Drawing 4] Detail drawing of each actuation phase of the equipment of the 1st example.
[Drawing 5] Detail drawing of the 1st example which is not shown in drawing 1 .
[Drawing 6] Drawing showing the 2nd modification of the 1st example.
[Drawing 7] Drawing showing a series of actuation phases of the 2nd modification of the 1st example.
[Drawing 8] The radiation direction sectional view showing the 2nd example of this invention equipment.
[Drawing 9] Drawing showing the modification of the 2nd example.
[Drawing 10] The top view of a controlling mechanism used in the 1st example shown in drawing 1 (called the cross section in a regular field, and a "longitudinal plane of symmetry" by drawing 1 by Axis MM and the geometrical axis of shaft 3D).
[Drawing 11] The sectional view which met the A-A line of drawing 10 .
[Drawing 12] The notional perspective view showing the 3rd example of this invention equipment.
[Description of Notations]
1 Heart Type
2 Press Equipment
4 Code
6 Interior Material of Proposal
31 Base Arm
31T Migration head
31R Center of rotation
311 Driving Pulley
312 Follower Pulley

[Translation done.]

* NOTICES *

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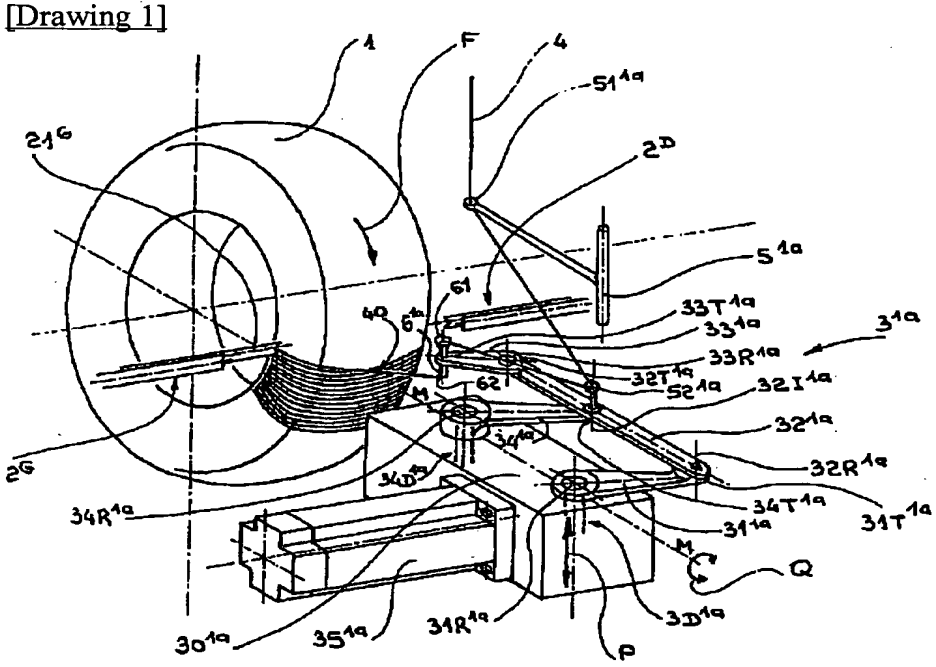
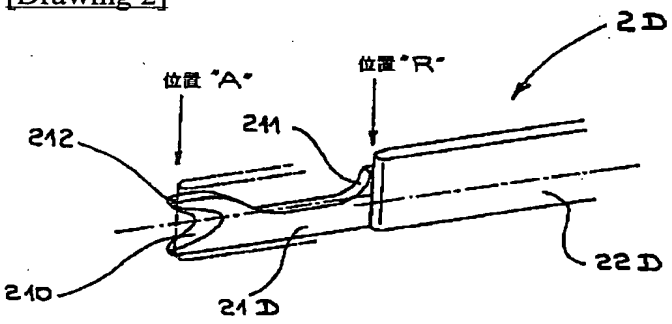
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

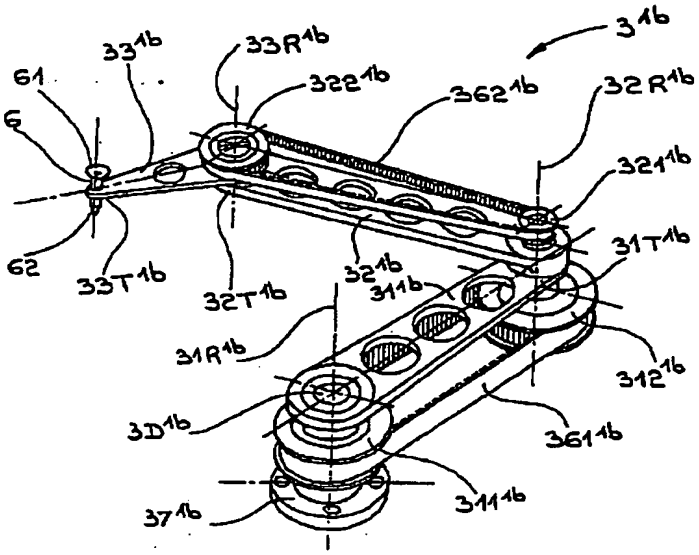
[Drawing 1]



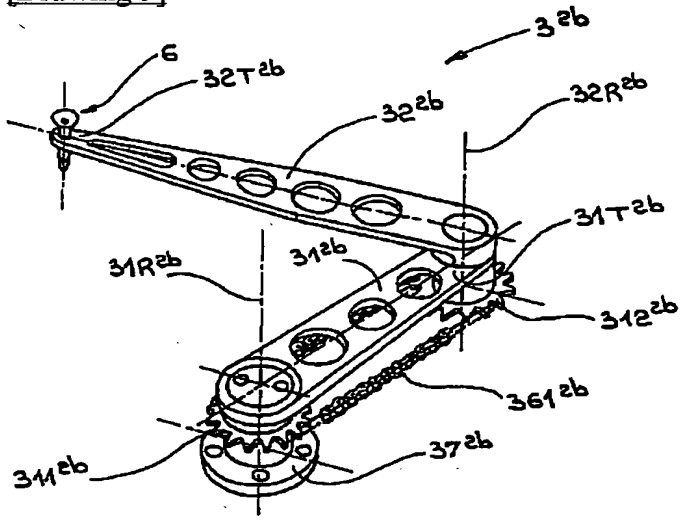
[Drawing 2]



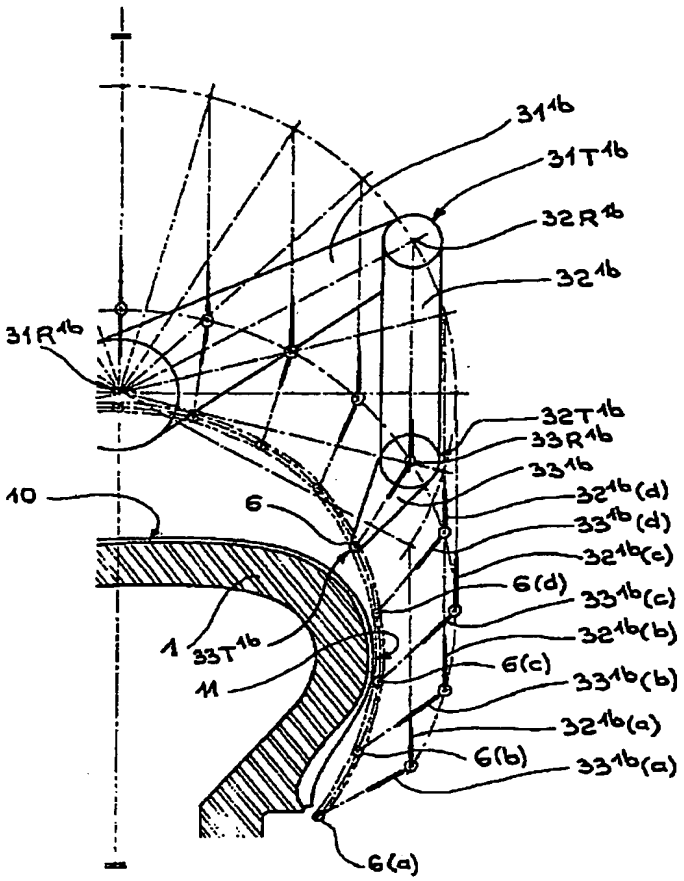
[Drawing 3]



[Drawing 9]



[Drawing 4]



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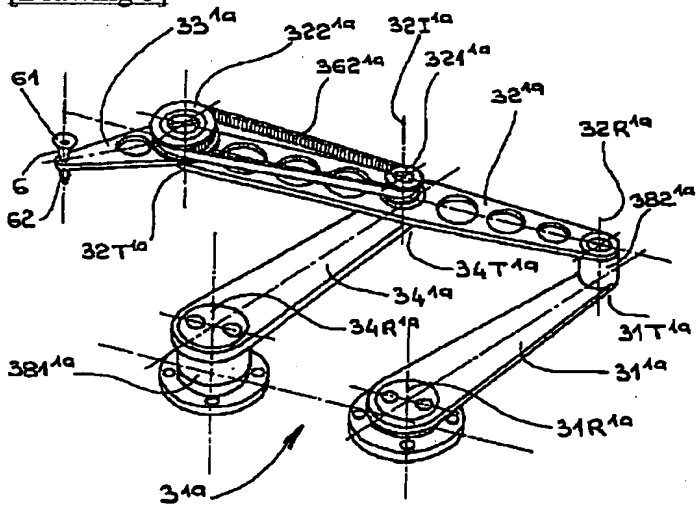

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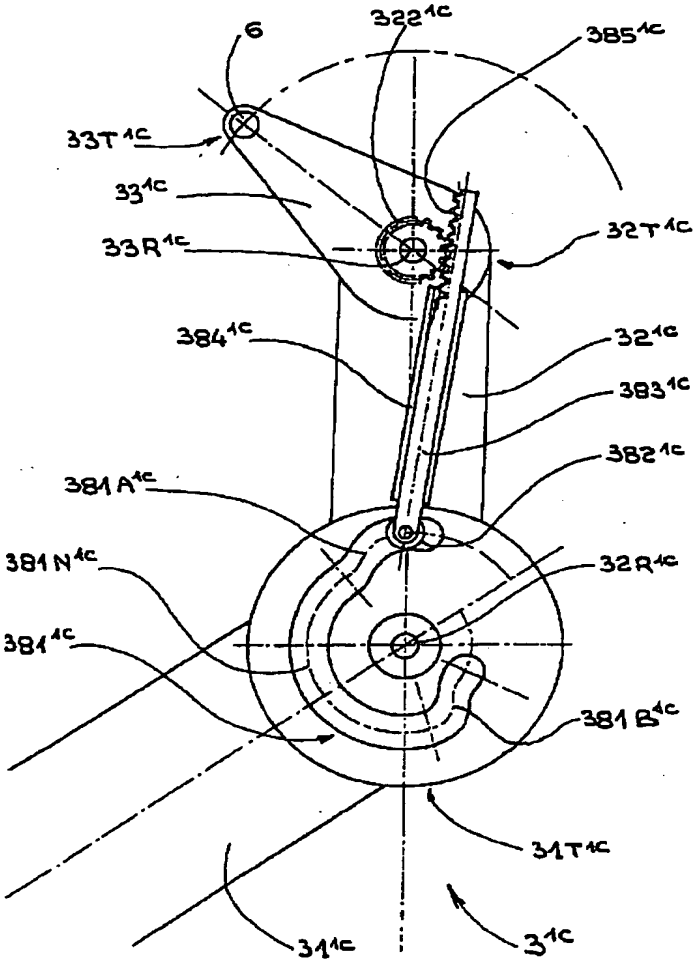
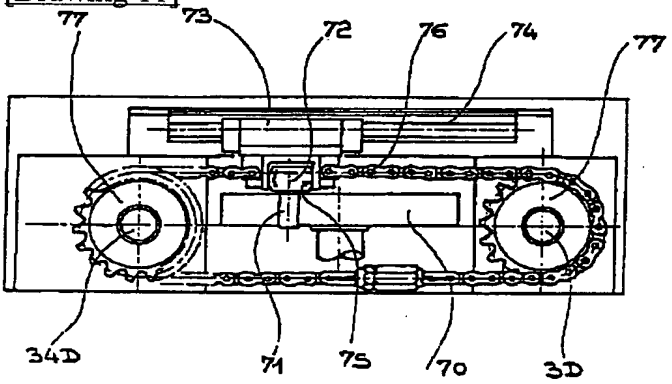


[Drawing 11]



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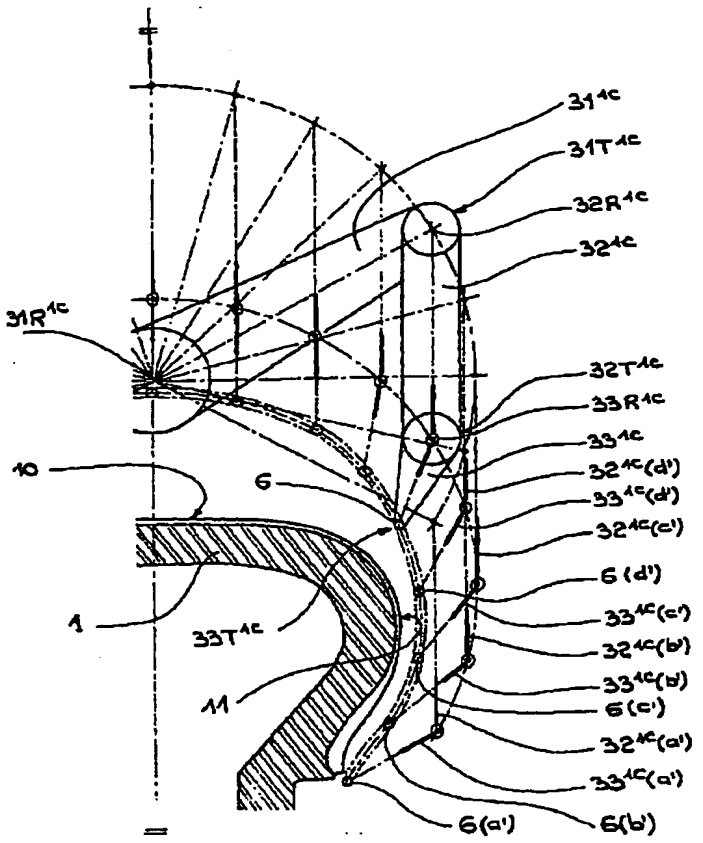

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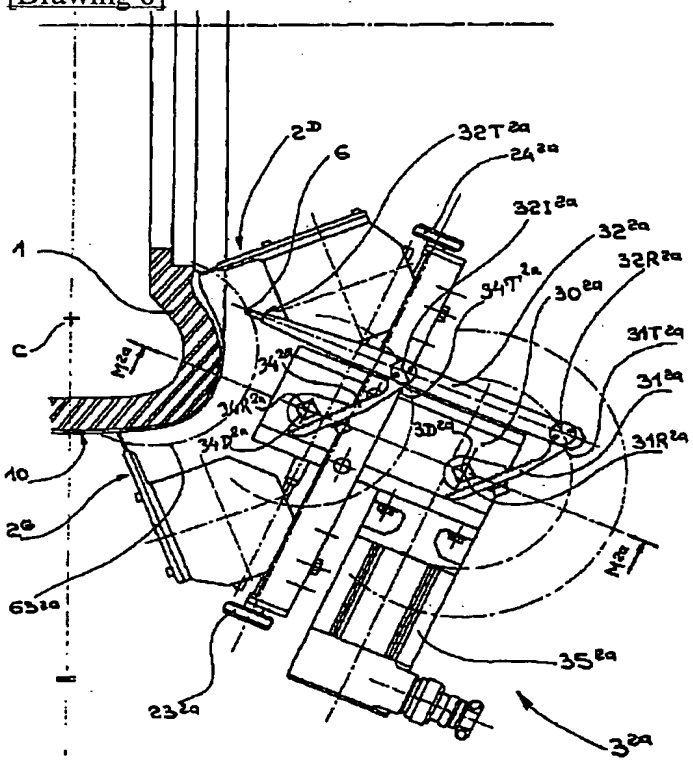

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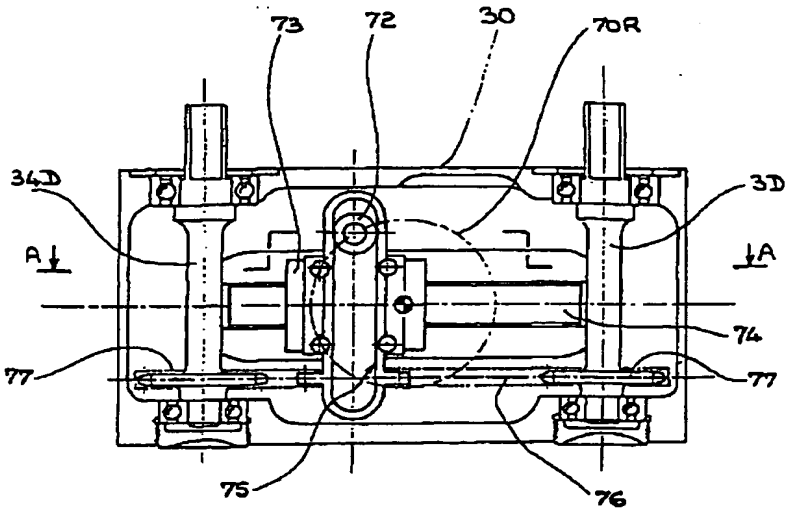
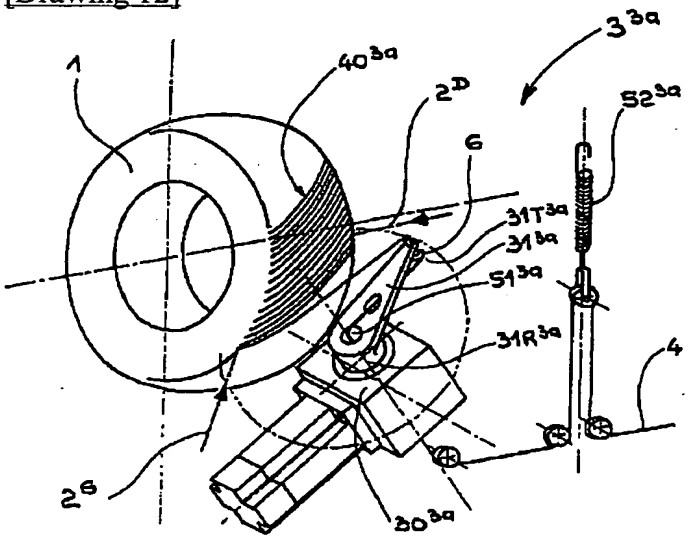


[Drawing 12]



[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2001－260245
(P2001－260245A)
(43)公開日　平成13年９月25日(2001.9.25)

(51)Int.Cl.⁷	識別記号	ＦＩ	ﾃｰﾏｺｰﾄﾞ(参考)
Ｂ２９Ｄ　30/10		Ｂ２９Ｄ　30/10	

審査請求　未請求　請求項の数14　ＯＬ　外国語出願　(全 45 頁)

(21)出願番号　特願2001－23294(P2001－23294)
(22)出願日　平成13年１月31日(2001.1.31)
(31)優先権主張番号　０００１３９３
(32)優先日　平成12年２月１日(2000.2.1)
(33)優先権主張国　フランス（ＦＲ）

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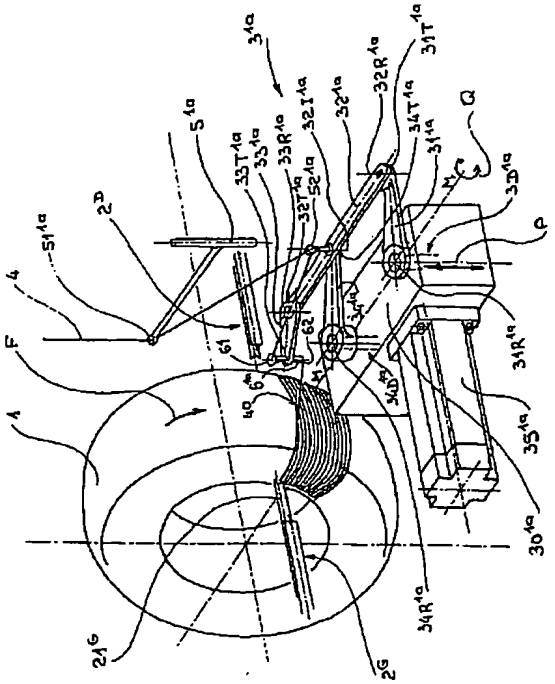
(54)【発明の名称】　一本のコードからタイヤ補強材を製造するための往復動アーム装置

(57)【要約】　(修正有)
【課題】タイヤ成形の内部空洞と同じまたは類似の形状の円管状の型の上で補強材を製造する方法であって、簡単な調整だけで広範囲のタイヤサイズへの対応が可能で生産速度が速い補強材の成形方法を提供する。
【解決手段】案内部材６の一連の往復動によって、カーカス補強材を構成するコード４を硬質芯型１上に互いに並べてアーチ状に配置する方法において、案内部材の移動手段が、回転中心３１Ｒと移送ヘッド３１Ｔとを有する少なくとも一つのベースアーム３１と、このベースアームを回転中心の周で往復動させる制御手段とを有し、かつ回転中心の幾何学軸線が動作位置で型の完全に外側にあるようにする。



1

【特許請求の範囲】

【請求項１】　供給装置を介して供給されるコード（４）をほぼ環状の型の上に所望の軌跡に従ってアーチ状に並べてタイヤ補強材を順次作っていく、ほぼ環状の型と協働して用いられるタイヤ補強材を製造する装置であって、下記ａ）～ｃ）：

ａ）コードが自由にスライドできる案内部材（６）と、

ｂ）前記案内部材を周期的な前後運動で移動させて、コードの上記の軌跡内の各所望端部の近傍へ案内部材を周期的に順次運ぶ移動手段と、

ｃ）軌跡の各端部近傍でコード（４）を型の表面上に押し付ける押圧装置（２）と、を有する装置において、

下記ｉ）およびｉｉ）を特徴とする装置：

ｉ）移動手段が回転中心（３１Ｒ）と移送ヘッド（３１Ｔ）とを有する少なくとも１つのベースアーム（３１）と、このベースアームをその回転中心の周で往復動運動させる制御手段とを有し、ベースアームの移送ヘッド（３１Ｔ）は案内部材を上記の軌跡の一端部から他端部まで直接または間接的に運び、

ｉｉ）回転中心の幾何学軸線は動作位置で型の完全に外側にある。

【請求項２】　ベースアーム（３１）の移送ヘッド（３１Ｔ）が案内部材（６）を直接支持する請求項１に記載の装置。

【請求項３】　第２アームの回転中心がベースアームの移送ヘッド（３１Ｔ）に取付けられ、第２アーム（３２）が案内部材を軌跡の一端部から他端部まで直接または間接的に運ぶ移送ヘッド（３１Ｔ）を有する第２アームの回転中心（３２Ｒ）に関節接続された第２アーム（３２）を有し、ベースアーム（３１）に対する第２アームの相対位置を制御する制御手段を有する請求項１に記載の装置。

【請求項４】　供給装置を介して供給されるコードを、ほぼ環状の型と協働して、型の表面上にコードの所望軌跡に従ってアーチ状に並べてタイヤ補強材を順次作成していく製造装置であって、下記：

ａ）コードが自由にスライドできる案内部材と、

ｂ）前記案内部材を周期的な前後運動で移動させて、コードの上記の軌跡内の各所望端部の近傍へ案内部材を周期的に順次運ぶ移動手段と、

ｃ）軌跡の各端部近傍でコード（４）を型の表面上に押し付ける押圧装置（２）と、を有する装置において、

移動手段が往復動ベースアームと少なくとも１本の他の往復動アームの少なくとも２本のアームを有し、この少なくとも２本のアームはそれぞれ回転中心と移送ヘッドとを有し、２本のアームの幾何学的回転軸線は互いに平行であり、さらに、各アームに各幾何学的回転軸線を中心とする往復動運動を伝える制御手段を有し、ベースアームの移送ヘッドは第２の往復動アームの回転中心を支持し、移送ヘッドが軌跡の一端部から他端部まで直接または間接的に案内部材を運び、ベースアームに対する第２アームの相対位置を制御する制御手段を備えていることを特徴とする装置。

2

【請求項５】　ベースアーム（３１）に対する第２アーム（３２）の相対位置を制御する制御手段がベースアームの回転中心と同心な駆動プーリ（３１１）を有し、この駆動プーリの角度位置がベースアームの往復動制御とは独立して制御され、第２アームと一体な従動プーリ（３１２）を有し、２つのプーリに歯付きベルト（３６１）が掛けられている請求項３または４に記載の装置。

【請求項６】　駆動プーリ（３１１）が空間内で固定されている請求項５に記載の装置。

【請求項７】　第２アームの回転中心（３２Ｒ）に関節接続された第２アーム（３２）を有し、第２アームの回転中心がベースアーム（３１）の移送ヘッド（３１Ｔ）に取付けられ、第２アームが軌跡の一端部から他端部まで直接または間接的に案内部材を運ぶ移送ヘッド（３２Ｔ）を有し、回転中心（３４Ｒ）の周りを往復動する補助アーム（３４）をさらに有し、この補助アームの回転中心の幾何学的回転軸線が型の表面と前記ベースアームの回転の幾何学軸線との間で型の表面の完全に外側に位置し、補助アームは移送ヘッド（３４Ｔ）を有し、第２アームは第２アームの回転中心（３２Ｒ）と第２アームの移送ヘッド（３２Ｔ）との間に中間の回転中心（３２Ｉ）を有し、この中間の回転中心は補助アームの移送ヘッド（３４Ｔ）に関節接続されている請求項１に記載の装置。

【請求項８】　第２アームの移送ヘッド（３２Ｔ）が案内部材（６）を直接支持する請求項３、４または７に記載の装置。

【請求項９】　回転中心（３３Ｒ）を介して第２アームの移送ヘッド（３２Ｔ）に関節接続された第３アーム（３３）を有し、第３アームが軌跡の一端部から他端部まで直接または間接的に案内部材を運ぶ移送ヘッド（３３Ｔ）を有し、第２アームに対する第３アームの相対位置を制御する制御手段を有する請求項３～７のいずれか一項に記載の装置。

【請求項１０】　第２アームの移送ヘッド（３３Ｔ）が案内部材（６）を直接支持する請求項９に記載の装置。

【請求項１１】　第２アームに対する第３アームの相対位置を制御する制御手段が基本的に第２アームの回転中心（３２Ｒ）と同心な駆動プーリ（３２１）を有し、この駆動プーリはベースアーム（３１）と一体であり、回転中心が第３アーム（３３）と一体な従動プーリ（３２２）を有し、駆動プーリと従動プーリとの間に歯付きベルト（３６２）が掛けられている請求項９と５、または、１０と５に記載の装置。

【請求項１２】　第２アームに対する第３アームの相対位置を制御する制御手段が基本的に第２アームの中間の回転中心（３２Ｉ）と同心な駆動プーリ（３２１）を備

え、この駆動プーリは中間アーム（３４）と一体であり、回転中心が第３アーム（３３）と一体な従動プーリ（３２２）を有し、駆動プーリと従動プーリには歯付きベルト（３６２）が掛けられている請求項９と７、または、１０と７に記載の装置。

【請求項１３】　第２アームに対する第３アームの相対位置を制御する制御手段が基本的にベースアームの移送ヘッドに配置されたカムと、第３アームと一体な歯車と、第２アームに対してスライド案内される接続ロッドとを有し、この接続ロッドは片側にカムと協働するカムフォロワーを、反対側には歯車と係合したラックを有する請求項９または１０に記載の装置。

【請求項１４】　案内部材を移動する手段の支持体を有し、この支持体に交互運動を伝えて芯型（１）上のコード（４）の軌跡を曲げる手段を有する請求項１～１３のいずれか一項に記載の装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明はタイヤの製造方法、特にタイヤ補強材を構成するコードの配置方法に関するものである。本発明は特に、タイヤ製造時にタイヤ素材を支持するほぼ円環状の型（タイヤの内部空洞と同じ形状またはそれに類似した形状を有する型）の上で補強材を製造する手段に関するものである。

【従来の技術】

【０００２】本発明の技術分野では、タイヤ補強材の製造がタイヤ自体の組立てに組み込めるようになっている方法および装置はすでに知られている。つまり、補強プライ等の半製品を用いるより、タイヤ製造時にコードリールから単数または複数の補強材をその場で製造するということである。これらの方法および装置の内、欧州特許第０，５８０，０５５号に記載の解決方法が、その外面が完成タイヤの内部空洞の型に実質的に対応するカーカス補強材を硬質の芯型上に製造するのに最も適合している。この特許明細書では、カーカス補強材を構成するためのコードが、プーリに設置されたチェーン上に固定された案内管を介して、硬質芯型上に隣接するアーチ状に取付けられ、一種のフォーク部材を形成して芯型を取り囲むようにする装置を開示する。案内管は芯型の周りを前後運動して、その往路および復路で各々１つずつのアーチを順次交互に取付け、適切な押圧装置を用いて前記アーチの端部を押し付けて、未硬化ゴムで予備被覆された硬質芯型上にアーチを形成する。

【０００３】

【発明が解決しようとする課題】本発明の目的は、実質的に同じ方法で、芯型上に補強コードを配置する設備の変形例を提供することにある。

【０００４】

【課題を解決するための手段】本発明は、適当な供給装置から必要に応じて供給されるコードをほぼ環状の型の上にコードの所望軌跡に従ってアーチ状を並べてタイヤ補強材を順次作成していくタイヤ補強材の製造装置であって、下記ａ）～ｃ）：

ａ）コードが自由にスライドできる案内部材と、

ｂ）前記案内部材を周期的な前後運動で移動させて、コードの上記の軌跡内の各所望端部の近傍へ案内部材を周期的に順次運ぶ移動手段と、

ｃ）軌跡の各端部近傍でコードを型の表面上に押し付ける押圧装置と、を有する装置において、下記ｉ）およびｉｉ）を特徴とする装置を提供する：

ｉ）移動手段が回転中心と移送ヘッドとを有する少なくとも１つのベースアームと、このベースアームをその回転中心の周で往復動運動させる制御手段とを有し、ベースアームの移送ヘッドは案内部材を上記の軌跡の一端部から他端部まで直接または間接的に運び、

ｉｉ）回転中心の幾何学軸線は動作位置で型の完全に外側にある。

【０００５】

【実施の形態】本発明装置はループを形成し、このループを芯型に対して押し付ける押圧装置を含むので、欧州特許出願第０，５８０，０５５号に記載を参照することができる。この押圧装置は基本的にフォーク部材とハンマーとからなるということを思い出されたい。欧州特許出願第０，５８０，０５５号に記載の押圧装置の実施例は２、３の詳細な部分を別にして以下で説明する新しい押圧装置にもそのまま使用できる。本発明の主要な違いはコード取付け部材、正確にはコードが自由にスライドできる案内部材（すなわち案内管）の駆動方法にある。すなわち、上記特許に記載のチェーンシステムの代わりに往復動アームシステムまたは以下に記載のシステムが用いられる。

【０００６】コード案内部材を駆動する本発明の新規な手段を詳細に説明する前に、いくつかの点を思い出しておくことは有用であろう。まず初めに、上記特許と同様に、「コード」という用語は全く一般的な意味を有し、単一の糸、複数の糸、例えばケーブルや撚糸等の集成体、少数のグループ化したケーブルまたは撚糸を含み、材料は任意であり、「コード」がゴムで予備被覆されてもいなくてもよいということを理解しなければならない。本明細書で「アーチ」という用語は１点から他点まで延びた補強材のコードの一部を表す。タイヤの全周に配置される全てのアーチがいわゆる補強体を形成する。ここで定義のアーチはカーカスの一部またはトレッド用補強材の一部またはその他の任意形式の補強材の一部でよい。このアーチは取付け途中でコードを切断して分離してもよく、また、例えばループを介して補強材中で全てが連結されていてもよい。

【０００７】本発明では基本的に補強コードを連続的に並べて完成品の形にできるだけ近い形にする。コードは例えばコードリールおよび利用可能であればリールから

引き出されるコードの張力を制御する装置等の適切な供給装置を介して必要に応じて供給される。このコードから補強材を製造する本発明装置はタイヤがその上に製造される型（硬質の芯型または補強されたブラダ）と協働する。完全な補強材を製造するのに取付け部材の複数の連続パスの２回のパスの間でコードを切断するかしないかは重要ではない。

【０００８】「放射方向、軸線方向、円周方向」という用語で位置または方向を表す場合または半径を表す場合は、上にタイヤが作られる芯型またはタイヤ自身が基準点になる。基準の幾何学軸線は型の回転軸である。同様に、上記特許で既に指摘したように、本発明のコード取付け部材によって補強材、例えばカーカス補強材を製造する製造中にコードの取付けピッチを変化させることができる。「取付けピッチ」は２つの互いに隣接するコード間の空間とコードの直径との和で表される距離である。カーカス補強材の場合にはコード間の空間は測定半径によって変るということが知られている。ここで言いたいのはこの変化ではなく、所定半径でピッチが変わることである。そのためには案内部材の速度を変えずに、任意の適切な規則の関数で型の回転速度を変えるだけでよい。それによって例えばラジアルカーカスの場合、カーカス補強コードが所定の放射方向位置に対して変わるように制御されたピッチで取付けられたタイヤが得られる。

【０００９】本発明は種々の実施例で実施できる。３つの主要な実施例を下記に示す。第１実施例では一連の３つの機能的な往復動アームを用いる。この第１実施例に対する変形例も記載してある。この一連の３つの機能的な往復動アームはタイヤの一方のビードから他方のビードまで延びたカーカスアーチを配置するのに用いるのが好ましい。第２実施例では一連の２つの機能的な往復動アームを用いる。この第２の実施例に対する変形例も記載してある。この一連の２つの機能的な往復動アームは例えばタイヤのビードからショルダーまで延びるカーカスアーチを配置するのに用いるのが好ましい。第３実施例では単一の機能的な往復動アームを用いる。最も単純な取付けを実施するのにはこのアームで十分である。

【００１０】一連の「ｎ」個の機能的な往復動アームを配置して用いる場合（ｎ＞１）、「ｎ番目のアーム」という用語はコード案内部材が直接固定される往復動アームを表し、ベースアームは常に「第１往復動アーム」である。各往復動アームはカスケード状に配置され、一般に往復動アーム「ｐ」（ｐ＞ｎである）の移送ヘッドが往復動アーム「ｐ＋１」の回転中心を支持する。移送ヘッドがコード案内部材を直接または「間接的」（単数または複数の他の機能な往復動アームを介して）支持すると述べたのはこのためである。全ての実施例で第１往復動アームの幾何学的回転中心軸は作業位置において型の完全に外にあり、この中心軸は決して型と接触しない

（その延長線上で接触もしない）。

【００１１】本発明装置のコード案内装置は実質的に平面に含まれる運動すなわちベースアームの幾何学的回転軸に垂直な運動面を描く。本発明装置の他の観点では、ベースアームまたは変形例で用いられる往復動アームが長い平面であり、ベースアームこの運動面を往復動するか、全ての往復動アームが平行移動するか、隣接する平面の１つがこの運動面に非常に近くなるか、移動する平面と合流する。

【００１２】本発明の別の観点では、一連の往復動アームの型に対する各位置を考慮せずに言って、本発明は互いに運動面に対して垂直に関節接続された一連のアームを有するタイヤ補強材製造装置を提供する。この装置は適切な供給装置から連続的に必要に応じて供給されるコードから成る補強材をほぼ環状の型と協働して用いて製造する。この装置は：

ａ）コードが自由にスライドできる案内部材と、

ｂ）前記案内部材を周期的な前後運動で移動させて、コードの上記の軌跡内の各所望端部の近傍へ案内部材を周期的に順次運ぶ移動手段と、

ｃ）軌跡の各端部近傍でコード（４）を型の表面上に押し付ける押圧装置（２）と、

を有する。本発明の特徴は移動手段が往復動ベースアームと少なくとも１本の他の往復動アームの少なくとも２本のアームを有し、この少なくとも２本のアームはそれぞれ回転中心と移送ヘッドとを有し、２本のアームの幾何学的回転軸線は互いに平行であり、さらに、各アームに各幾何学的回転軸線を中心とする往復動運動を伝える制御手段を有し、ベースアームの移送ヘッドは第２の往復動アームの回転中心を支持し、移送ヘッドが軌跡の一端部から他端部まで直接または間接的に案内部材を運び、ベースアームに対する第２アームの相対位置を制御する制御手段を備えている点にある。本発明の上記の全ての観点は添付図面を参照した以下の説明から理解できよう。なお、本発明が下記実施例に限定されるものではない。

【００１３】

【実施例】図１は型（forme）がタイヤ内面形状を規定する着脱自在な硬質の芯型１であることを示している。しかし、これに限定されるものではない。この芯型１はゴム層１０（図７参照）、例えばブチルゴムをベースにした密封ゴム層とカーカスコードを確実に保持するためのゴム層とで被覆されている。芯型１上に配置されたコード４は芯型１を被覆するこのゴム層１０の粘着効果によって保持される。芯型１は図示していない任意の装置によって回転させるということは理解できよう。

【００１４】取付け部材は基本的に往復動アームシステム3^{1a}と押圧装置2^{G}、2^{D}とからなる。なお、図の参照番号では類似部材に対しては同じ主参照番号を付け（例えば往復動アームシステムには「３」を付け）、その実

7

施例や変形例は指数を付けて表している（例えば第１実施例の変形例「ａ」には「^{1a}」を付けてある）。特定の指数の無い参照番号は各変形例で常に同じ部材であるか、全ての実施例および変形例に共通のものを示している。

【００１５】図１に示す第１実施例では、往復動アームシステム3^{1a}がカスケード状に配置された３本の機能的な往復動アーム31^{1a}、32^{1a}、33^{1a}と、補助アーム34^{1a}とを有している。本発明では３本の往復動アームを有するこの構造によってコード４の案内部材を一方のビードから他方のビードへ容易に移動させることができ、本発明装置を各ビードにおいて押圧装置2^{G}、2^{D}と一緒に運動させることができる。コード案内部材は全ての実施例で案内管（oeilleton、アイレット）６になっているが、これに限定されるものではない。この案内管６は最後の往復動アーム３３に取り付けられている。詳細な説明をする前に、この往復動アームシステム３は前記欧州特許第０，５８０，０５５号に記載のチェーンシステムと同じ役目をし、押圧装置2^{G}、2^{D}はこの欧州特許第０，５８０，０５５号に記載の役割をするように適当な方法で位置決めされるということを簡単に述べておく。

【００１６】往復動アームシステム3^{1a}はプレート30^{1a}上に取付けられて、案内管６に芯型１の上方を通過する運動（多くの実施例では芯型１の周りを回る運動）を描かせる。図示した全ての例で往復動アームシステム３は案内管６を一つの面内で運動させる。案内管６は漏斗形をしており、コード４が到達する側は大きな開口部６１を有し、コード４が出ていく側は小孔６２になっている（図３も参照）。この小孔６２が案内部材６の上記面内での運動をする。一般にこの小孔６２の出口部分はほぼ運動面内（案内管６の案内方向に垂直な面内）に配置されるので、小孔６２のエッジを注意深く加工してコード４に傷を付けないようにする。変形例では案内管を離れる際のコードの平均向きに近い向きに案内管をセットすることができる。

【００１７】プレート30^{1a}は往復動アームシステムをモーター駆動する往復動シャフト$3D^{1a}$（図１０、図１１を参照）を備えている。この往復動シャフト$3D^{1a}$の幾何学軸線は芯型１の外側放射線上にある。換言すれば、往復動シャフト$3D^{1a}$の幾何学軸線の延長線は芯型１と接触せず、芯型１の表面の外側に位置する。往復動シャフト$3D^{1a}$は連続的回転せず、３６０° 以下の所定の円弧角度で往復動運動する。この円弧角度の正確な値は往復動アームシステム３の正確な構成およびその使用目的によって決まる。

【００１８】往復動アームシステム３は非常にコンパクトである。この往復動アームシステム３に押圧装置２とモータおよび駆動機構を含む取付け部材の集合体がサブアセンブリを形成する。このサブアセンブリは簡単な方

8

法で芯型に接近、後退させることができ、また、芯型に他の装置（例えばタイヤ製造用の装置や、芯型をタイヤ製造の他のステーションへ移動させる装置）を接近、後退させることができる。

【００１９】第１アーム（ベースアーム）31^{1a}は往復動シャフト$3D^{1a}$に回転中心$31R^{1a}$の所で取付けられている（図１）。この第１アーム31^{1a}は回転中心$31R^{1a}$の反対側端部に移送ヘッド$31T^{1a}$を有する。第２アーム32^{1a}の関節接続された回転中心$32R^{1a}$は第１アーム31^{1a}の移送ヘッド$31T^{1a}$に取付けられている。この第２アーム32^{1a}は移送ヘッド$32T^{1a}$を有している。第１アーム31^{1a}に対する第２アーム32^{1a}の相対位置を制御するためにこの実施例では平行四辺形を形成する補助アーム34^{1a}が用いられる。この補助アーム34^{1a}の回転中心$34R^{1a}$は往復動シャフト$34D^{1a}$に取付けられて往復動する。回転中心$34R^{1a}$は芯型１の表面より放射方向外側で且つ芯型１の表面と第１アーム31^{1a}の回転中心$31R^{1a}$との間の放射線上に位置している。補助アーム34^{1a}は第２アーム32^{1a}に関節接続された移送ヘッド$34T^{1a}$を有し、第２アームはこの端部に中間の回転中心$32I^{1a}$を有する。この回転中心$32I^{1a}$は第２アーム32^{1a}の回転中心$32R^{1a}$と移送ヘッド$32T^{1a}$との間に位置している。

【００２０】回転中心$31R^{1a}$、$34R^{1a}$および移送ヘッド$31T^{1a}$、$34T^{1a}$が存在する特異点が平行四辺形を形成しなくてもよいことに注意しなくてはならない。これらの点は回転中心$31R^{1a}$、$34R^{1a}$を結ぶ軸線MMおよびシャフト３Ｄの幾何学軸線（およびこれと平行なシャフト$34D^{1a}$の幾何学軸線）で規定される中心位置が中心面（plan median）を通る際に互いに正確に整合するのが好ましい。すなわち、案内管６の運動の軌跡は中心面に対して対称になり、案内管は芯型１上の規定された各ビード領域の近傍でも完全に対称な運動をする。しかし、このことが案内管の運動の終点で中心面に対して対称にならない場合（例えばアーチの軌跡が対称ではないタイヤを製造する場合）を除外するものではないということは理解できよう。これは各ビードの取付け部（一般的な用語では取付けビード）の直径が異なるタイヤを製造する場合に相当する。

【００２１】本発明装置は第３アーム33^{1a}を有し、この第３アーム33^{1a}の回転中心$33R^{1a}$は第２アーム32^{1a}の移送ヘッド$32T^{1a}$に関節接続されている。第３アーム33^{1a}は移送ヘッド$33T^{1a}$を有し、案内管６はこの移送ヘッド$33T^{1a}$に直接取付けられている。第２アーム32^{1a}に対する第３アーム33^{1a}の相対位置の制御手段（図を複雑にしないために図１には示していない）は図５を用いて以下で説明する。ここでは、第２の往復動アームに対して可動な第３の往復動アームを用いることによって案内管６を直接支持した移送端部をビードに接近させることができるということ、換言すれば、第１

9

アームの回転中心に対して芯型１の壁の周りを巡って、放射方向の観察方向に対して壁で隠されていた領域へアクセスする運動を助けるということだけを述べておく。また、第２アーム３２^{1a}に対して第３アーム３３^{1a}が所定の方向を向いているので各アーム間の機能の自由度が大きいということは良く理解できよう。

【００２２】図１０、図１１に詳細に示すように、モータ３５^{1a}は２本のシャフト３Ｄ^{1a}および３４Ｄ^{1a}をモーター駆動して全てのアーム３１^{1a}、３２^{1a}、３３^{1a}、３４^{1a}の運動を制御するのが好ましい。モータ３５^{1a}はディスク７０を回転する。このディスク７０の所定の偏心位置にはシャフト７１が取付けられている。このシャフト７１はローラ７２を支持している。キャリッジ７３はプレート３０^{1a}のケーシングに形成されたスライド７４上を軸線方向に動く。キャリッジ７３はスライド７４上のキャリッジ７３の前後運動方向に対して直角な方向を向いた直線状スロット７５を有している。チェーン（テンダー付き）７６は２つの同一のピニオン７７上に巻かれており、その両端部はキャリッジ７３に接続している。各ピニオン７７はシャフト３Ｄおよびシャフト３４Ｄに固定されている。

【００２３】モータ３５が制御シャフト７１を一定速度で回転駆動すると、ローラ７２が一定速度で円運動７０Ｒをする。その結果、ローラ７２はスロット７５内を上下動し、キャリッジ７３を軸方向に動かす。すなわち、一定速度の回転運動が速度が正弦波形に変化する交互直線運動に変換される。この交互直線運動はチェーン７６および互いに同一な２つのピニオン７７を介してシャフト３Ｄおよび３４Ｄの３６０° 以下の弧を描く往復動運動に変換される。この往復動運動の振幅はディスク７０上でのシャフト７１（従ってローラ７２）の偏心半径を調整することで調整できる。この機械的な運動変換法則にモータ３５のロータの回転に特有な任意の制御法則を重ねることも可能である。

【００２４】図１の説明に戻ると、コード４はリール（図示せず）および供給装置５^{1a}を介して供給される。供給装置５^{1a}はコード４が取付け部材に正確に供給されるようにする。コード４は周期的に変化する速度（負の速度になることもある）で取付け部材によって引き出されるので、供給装置５^{1a}はコード４の張力を制御し、必要な場合には取付け部材３^{1a}とリールとの間の補償をする手段を有している。コード４は第１リング５１^{1a}を通る。この第１リング５１^{1a}は案内管６が周期運動をする運動面から少し離れ、芯型１に対して真中に配置されている。次いで、コード４は第２アーム３２^{1a}に固定されたリング５２を通る。

【００２５】さらに、コード４は案内管６を通る。案内管６は一方のビードから他方のビードへ、より正確には一方のビードに近い位置から他方のビードに近い位置へ往復運動する。本発明の基本サイクルは下記段階：

10

1）コードを十分な時間型に当接させた状態で、案内管の運動面内で案内管（案内部材）を第１端部まで移動させ、

2）この第１端部でコードを型に押圧した状態で、少なくとも十分な時間押圧装置でコードを保持し、

3）反対方向へ向かって第１段階を第２端部まで繰り返し、

4）第２端部でコードを型に押圧した状態で、別の押圧装置でコードを保持する、

を有し、案内部材の運動と同期して型を動かして、型の表面上に所望の軌跡に沿って所望数のコード４のアーチが配置されるまで上記の基本サイクルを繰り返す。

【００２６】図２は押圧装置２^{D}を示している。この押圧装置２^{D}はフォーク部材２１^{D}とハンマー２２^{D}とを有し、これらは後退位置Ｒ（芯型１から遠い位置）と前進位置Ａとの間を移動する。前進位置のハンマーは破線で示してある。図の参照番号では、押圧装置の各部材に主参照番号（例えばフォーク部材に対しては「２１」）を付け、押圧装置の特定位置（図１では左側または右側）を表すために指数「^{G}」（左）または「^{D}」（右）を付けてある。特定指数の無い参照番号は押圧装置がどちらか側にあってもよい場合か、一般的な場合を表す。

【００２７】フォーク部材およびハンマー２２のそれぞれの機能に関しては前記の欧州特許第０，５８０，０５５号の説明を参照されたい。この特許には前進位置Ａおよび後退位置Ｒでのそれぞれの役目が記載されている。図２からフォーク部材２１およびハンマー２２が平行なブレードの形をしていることが理解できよう。フォーク部材２１はハンマーに対して放射方向で常に芯型１の回転軸側に配置されている。フォーク部材２１はコード４をその中心に掴むためにＶ字型ヘッド２１０を有している。コード４を把持すの際には「Ｖ」で形成される面がコード４に垂直に配置される。コード４を放射方向に配置しなくてはならない場合（図１の場合）には、フォーク部材２１を形成するブレードは芯型１と同心な円に正接する方向を向いている。フォーク部材２１は凹み２１１を有している。この役目は以下で説明する。

【００２８】フォーク部材２１はコード４を芯型１へ向かって運ぶものであるということは理解できよう。従って、芯型１へ向かうフォーク部材の前進運動は案内管６がコード４をその前後運動の一方の端部へ導いた時（すなわち本発明装置がほぼ図４の形になった時）に開始される。フォーク部材２１の運動はフォーク部材がコード４を芯型１を被覆しているゴムに固定した時に止まる。従って、フォーク部材２１は十分な力でコード４を所望位置に正確に接着することができる。図１に戻って、往復動アームシステム３が運動を続けると、芯型１が所望の取付けピッチ（これは矢印Ｆで概念的に示した芯型１の回転運動の関数である）で回転運動し、フォーク部材２１の先端２１２の周りにループが形成され、芯型１上

に新しいコード４のアーチ４０を取付ける運動が始まる(図１参照)。上記の凹み２１１は戻り段階（この段階ではフォーク部材２１が芯型１に当接している）中に案内管６をフォーク部材２１を越えて通すことができるようにする。ループの大きさは先端２１２の寸法の関数であることは理解できよう。

【００２９】ハンマー２２は案内管６の戻り段階後にフォーク部材２１が作動した後に作動する。ハンマー２２は放射方向のわずかに高い位置でコード４を押圧する。ハンマー２２はフォーク部材２１が後退する間コード４を保持しているのが好ましい。すなわち、フォーク部材が後退する間にハンマー２２によってコード４を保持することによって、フォーク部材２１の先端２１２の周りに形成されるコード４のループがフォーク部材２１と一緒に運ばれるのを防止することができる（コード４はゴムに接着した時でもフォーク部材に接着する傾向がある）。これによってコード４を確実にビードに固定（アンカー）することができる。

【００３０】往復動アームシステム3^{1a}と同期するフォーク部材２１およびハンマー２２の前進位置への移動および後退位置への戻り運動は任意の適当な装置によって制御されるということは罹患できよう。例えばベルトやケーブルを用いた機械的伝動装置または複数のモータを電気的に同期させる装置を用いてシャフト３Ｄの戻り運動を制御する。以下の図ではこの装置またはそれに相当するものを単に矢印で概念的に示し、参照番号２で表す。これは一般にコード４に順次作用するフォーク部材およびハンマーの２つの動作部材全体を表すということは理解できよう。

【００３１】図３は往復動アームシステム3^{1b}を有する第１実施例の変形例を示し、この往復動アームシステム3^{1b}は第１アーム（ベースアーム）31^{1b}に対する第２アーム32^{1b}の運動を制御する手段が前記往復動アームと基本的に異なっている。第１実施例のこの変形例のアームシステム3^{1b}もカスケード状に配置された３本の機能的なアーム31^{1b}、32^{1b}、33^{1b}を有し、これらのアームは上記制御手段によって一方のビードから他方のビードまで運転し、押圧装置と一緒に機能する。第１アーム（ベースアーム）31^{1b}は回転中心$31R^{1b}$を介して往復動シャフト$3D^{1b}$に取付けられている。第１アーム31^{1b}は上記の回転中心$31R^{1b}$とは反対側の端部に移送ヘッド$31T^{1b}$を有している。第２アームの回転中心$32R^{1b}$に関節接続された第２アーム32^{1b}は第１アーム31^{1b}の移送ヘッド$31T^{1b}$に取付けられている。この第２アーム32^{1b}は移送ヘッド$32T^{1b}$を有している。本発明装置では、回転中心$33R^{1b}$を介して第２アーム32^{1b}の移送ヘッド$32T^{1b}$に関節接続された第３のアーム33^{1b}がある。この第３アーム33^{1b}は移送ヘッド$33T^{1b}$を有し、案内管６はこの移送ヘッドに直接取付けられている。

【００３２】駆動プーリ311^{1b}は第１アームの回転中心$31R^{1b}$と同心で、前記のプレート（図３には図示せず）に固定されたフランジ37^{1b}と一体になっている。従動プーリ312^{1b}は第２アーム32^{1b}と一体である（相対回転が全く無い）。これらの駆動プーリと従動プーリとの間は歯付きベルト361^{1b}で接続されている。駆動プーリおよび従動プーリの直径は同一であり、第２アーム32^{1b}はその運動中これらプーリと常に平行である。各アームの位置を正確に決めるためには歯付きプーリを使用しなければならないということは当業者には理解できよう。ベルトも対応するプーリに対して相対スライドせずに運動できる歯付ベルトにする。すなわち、位置を制御すべき各アームを例えばチェーンやピニオン等の滑りの無い任意の装置を用いて接続するということは理解できよう。本明細書では「プーリ」および「ベルト」という用語は相対位置を滑り無しに制御することができる全てのシステムを意味する。

【００３３】この実施例ではフランジ37^{1b}は空間的に静止しているが、一般的には第１アームの往復動運動の制御とは独立してこのフランジの角度位置を制御することが重要である。例えば上記プレートとフランジ37^{1b}との間の運動に自由度を与えてプレートに対するフランジ37^{1b}の相対位置を制御し、それによって駆動プーリ311^{1b}の空間位置を選択的に制御し、寸法の異なる型に合せて案内管６を運動させることができる。

【００３４】第３アーム33^{1b}の第２アーム32^{1b}に対する相対位置を制御する手段は第２アーム32^{1b}の回転中心$32R^{1b}$と同心で、第１アーム31^{1b}と一体な（相対回転不可）駆動プーリ321^{1b}と、第３アーム33^{1b}と一体な（相対回転不可）従動プーリ322^{1b}とからなる。これらの駆動プーリと従動プーリとの間には歯付きベルト362^{1b}がかけられている。駆動プーリと従動プーリの直径は互いに異なり、運動中に第２アーム32^{1b}が芯型１のサイドウォール１１に衝突しないで、移送端部$33T^{1b}$が芯型１のビード近傍の領域（図４参照）に接近できるように各直径の値を計算する。

【００３５】図４は往復動アーム31^{1b}、32^{1b}、33^{1b}の前後運動の一端部で本発明装置が占める各位置６（ａ）における案内管６の状態を示している。第２アームおよび第３アームが占める対応する配置は32^{1b}（ａ）および33^{1b}（ｂ）でそれぞれ示してある。位置および配置の違いは参照文字（ｂ）、（ｃ）、（ｄ）で表してある。

【００３６】変形例では駆動プーリ321^{1b}を第１アーム31^{1b}に対して自由に設置し、駆動プーリ321^{1b}と一体な一つのプーリと幾何学軸線$3D^{1b}$と同心な他のプーリ(図示せず)とに巻き付けたベルトで駆動することによって第１アームの運動およびプーリ311^{1b}の運動の両方から独立して駆動することもできる。これによって第２アームに対する第３アームの相対運動の制御の自由

度が大きくなる。

【００３７】図５は図１の往復動アームシステム３^{1a}に取付けられる、それと均等な制御手段を表している。この図には第２アーム３２^{1a}の中間回転中心３２Ｉ^{1a}と同心で中間アーム３４^{1a}と一体な（相対回転不可）第３プーリ３２１^{1a}と、第３アーム３３^{1a}と一体な（相対回転不可）第４プーリ３２２^{1a}とが示してある。これらの駆動プーリと従動プーリとには歯付きベルト３６２^{1a}が掛けられている。駆動プーリと従動プーリの直径は互いに異なり、プーリの運動中に第２アーム３２^{1a}が芯型１のサイドウォール１１と衝突しないで、移送端部３３Ｔ^{1a}が芯型１のビード近傍領域（図４参照）に達するように直径の値を計算する。第２アームに対する第３アームの相対運動を制御する他の方法に関する上記の説明はこの変形例にも適用できる。

【００３８】図５に示した他の詳細についても注意されたい。この図ではアームシステム３^{1a}がほぼ図１で示されるように配置されている。この配置では第２アーム３２^{1a}が第１アーム３１^{1a}および中間アーム３４^{1a}の片側（軸線MMおよびシャフト３Ｄ^{1a}の幾何学軸線によって規定される中心面の片側）に設置され、案内管６はこの中心面の一方の側に位置する芯型１の半分の上を運動する間にそれと同じ側にとどまっている。第２アーム３２^{1a}は芯型の一方の側から他方の側へ移動する際に中心面の反対側へ行き、この通過時に第１アーム３１^{1a}および中間アーム３４^{1a}も反対側へ行く。この同じ運動中、中間アーム３４^{1a}は第１アーム３１^{1a}の上を通過する。従って、アームを正確に重ねてこの運動を可能にすることが重要である。そのためにスペーサスリーブ３８１^{1a}および３８２^{1a}が設けられている。このことは一般的なことであり、往復動アームを互いに関節接続し、中心面に対して対称運動させる場合には各アームが互いに重なって所望の交差ができるようにしなければならない。

【００３９】図６、図７は第１実施例のさらに他の変形例を示している。この変形例も第３アーム３３^{1c}の運動の制御の方法が異なる。この第１実施例の変形例でもアームシステム３^{1c}がカスケード状に配置された３本の機能的なアーム３１^{1c}、３２^{1c}、３３^{1c}を有し、上記の制御手段によって本発明装置は一方のビードから他方のビードまで運動する。

【００４０】図６、図７に示す第１アーム（ベースアーム）３１^{1c}と第２アーム３２^{1c}との相対運動はアームシステム３^{1a}または３^{1b}で説明したものと同じであるので説明は省略する。第１アーム３１^{1c}は移送ヘッド３１Ｔ^{1c}を有し、第２アームの回転中心３２Ｒ^{1c}に関節接続された第２アーム３２^{1c}は第１アーム３１^{1c}の移送ヘッド３１Ｔ^{1c}に取付けられている。この第２アーム３２^{1c}は移送ヘッド３２Ｔ^{1c}を有している。この実施例では回転中心３３Ｒ^{13}を介して第２アーム３２^{1c}の移送ヘッド３２Ｔ^{1c}に関節接続された第３アーム３３^{1c}を有している。この第３アーム３３^{1c}は移送ヘッド３３Ｔ^{1c}を有し、案内管６はこの移送ヘッドに直接取付けられている。第１アーム３１^{1c}の移送ヘッド３３Ｔ^{1c}にはカム３８１^{1c}が機械加工されている。このカム３８１^{1c}は一定の平均半径に機械加工された中立部分３８１Ｎ^{1c}と、芯型の一方の側で第３アーム３３^{1c}の相対運動を制御する半径が増加する最終制御部分３８１Ａ^{1c}と、芯型の反対側で第３アーム３３^{1c}の相対運動を制御する半径が減少する最終制御部分３８１Ｂ^{1c}とを有している。第３アーム３３^{1c}の回転中心３３Ｒ^{1c}には歯車３２２^{1c}が設置されている。この歯車３２２^{1c}は第３アーム３３^{1c}と一体である（相対回転不可）。接続ロッド３８３^{1c}は第２アーム３２^{1c}と一体な案内３８４^{1c}内をスライドする。すなわち、接続ロッド３８３^{1c}は第２アーム３２^{1c}に対してスライドするように案内される。接続ロッド３８３^{1c}は一方の側でカム３８１^{1c}と協働するカムフォロワー３８２^{1c}を支持する。接続ロッド３８３^{1c}はカムフォロワー３８２^{1c}の反対側に歯車３２２^{1c}と係合するラック３８５^{1c}を有する。最終制御部分３８１Ａ^{1c}および３８１Ｂ^{1c}のカムのプロフィールを選択し、第３アーム３３^{1c}の運動中に第２アーム３２^{1c}が芯型１のサイドウォールに衝突しないで第３アーム３３^{1c}の移送端部３３Ｔ^{1c}に取付けた案内管６が芯型１のビード近傍領域（図７の位置６ａ参照）に達するようにする。

【００４１】図７は往復動アーム３１^{1c}、３２^{1c}、３３^{1c}の前後運動の一方の端部においてカム装置によって与えられる位置６（ａ'）にある案内管６の状態を示している。第２アームおよび第３アームが占める対応する位置は３２^{1c}（ａ'）および３３^{1c}（ａ'）でそれぞれ示してある。他の位置および配置は参照文字（ｂ'）、（ｃ'）、（ｄ'）で表してある。図４と図７を比較すると、（ａ）および（ａ'）で表された位置が同じ場合、図７で（ｂ'）、（ｃ'）、（ｄ'）で表示された位置は図４の位置（ｂ）、（ｃ）、（ｄ）とは幾分異なっていることが分かる。サイドウォール１１の高さの所にカム制御手段によって維持、許容される比較的大きな遊びが見られる。

【００４２】カム制御では相対運動が実質的にカムのプロフィールに依存するため第２アームと第３アームとの間の相対運動を要求に沿ってかなり自由に選択することができる。従って、図３および図５を参照して説明したベルト制御に特有な第１アームと第２アームとの間の相対回転運動に関する比例関係の制約が取り除かれる。特に、案内管６を芯型１から急速に開放するように第２アームに対して第３アームの相対位置を決めることが可能になる。すなわち、ビード領域（位置６ａ参照）で芯型１の表面の十分近くを運動しながら移送ヘッド３３Ｔ^{1c}と芯型１（位置６ｂ、６ｃおよび６ｄ参照）との間に一定の十分な遊びを確保することができる。カム３８１^{1c}で部分３８１Ｂ^{1c}および他の方向を向く部分３８１Ｄ^{1c}が

15

ほんの短距離でかなりの位置の変化（急速な位置の変化）を与え（カム３８１^{1c}に沿った曲線ｘ方向移動）、各ビードに接近する際に案内管６の運動の両端部でカムが第３アーム３３^{1c}を第２端部の各片側で揺動させるということが理解できよう。

【００４３】図８、図９に示した第２実施例では、往復動アームシステム３^{2a}が２つのカスケード状の機能的な往復動アーム３１^{2a}および３２^{2a}を有している。この実施例はビードからショルダーまでの運動、例えば片側カーカスの製造用に設計されている。すなわち、カーカスが一方のビードから他方のビードまで連続せずにトレッドのどこかで中断しており、両側カーカス間の力の伝達をベルト補強材で行うラジアルタイヤが知られている。この場合のカーカス補強材はビードとショルダーとの間に配置しなければならない。上記の往復動アームシステム３^{2a}は第３アームが無いことを除き前記の往復動アームシステム３^{1a}で用いた平行四辺形の原理を用いている。プレート３０^{2a}が制御モータ３５^{2a}を支持し、制御モータ３５^{2a}はシャフト３Ｄ^{2a}および３４Ｄ^{2a}を駆動し、これらのシャフトの回転軸線は中心面Ｍ^{2a}－Ｍ^{2a}内に含まれる。制御モータ３５^{2a}は押圧装置２^{G}および２^{D}も駆動する。これらの押圧装置は図２で詳細に説明したものと同じ型のものである。中心面Ｍ^{2a}－Ｍ^{2a}に対する押圧装置２^{G}および２^{D}の間隔はハンドル２３^{2a}および２４^{2a}で調整できる。

【００４４】第１アーム（ベースアーム）３１^{2a}はその回転中心３１Ｒ^{2a}を介して往復動シャフト３Ｄ^{2a}に取付けられている。基準点として芯型１の放射中心Ｃをとると、回転中心３１Ｒ^{2a}は芯型１の表面より外側に位置している。第１アーム３１^{2a}は移送ヘッド３１Ｔ^{2a}を有し、第２アームの回転中心３２Ｒ^{2a}に関節接続された第２アーム３２^{2a}は第１アーム３１^{2a}の移送ヘッド３１Ｔ^{2a}に取付けられている。この第２アーム３２^{2a}は移送ヘッド３２Ｔ^{2a}を有する。第１アーム３１^{2a}に対する第２アーム３２^{2a}の相対位置を制御するために、この実施例では回転中心３４Ｒ^{2a}を介して往復動シャフト３４Ｄ^{2a}の周りを往復動するように取付けられた補助アーム３４^{2a}を用いて平行四辺形が形成されている。芯型１の放射中心Ｃを基準点とした場合、回転中心３１Ｒ^{2a}は芯型１の表面の外側で芯型１の表面と第１アーム３１^{2a}の回転中心３１Ｒ^{2a}との間に位置する。補助アーム３４^{2a}は第２アーム３２^{2a}に関節接続された移送ヘッド３４Ｔ^{2a}を有し、第２アームは第２アーム３２^{2a}の回転中心３２Ｒ^{2a}と移送ヘッド３２Ｔ^{2a}との間に位置する中間の回転中心３２Ｉ^{2a}を有する。案内管６は第２アーム３２^{2a}の移送ヘッド３２Ｔ^{2a}に直接支持されている。案内管６の運動は軌道６３^{2a}で示してある。２つの往復動アームを有するこの装置はビードから反対側のショルダーを含むトレッドの下側の任意の点までの運動に用いることができ、コードを各片側カーカスで部分的に重複した状態で

16

配置することができる。

【００４５】図９は図８のシステムで説明したものとは第１アーム（ベースアーム）３１^{2b}に対する第２アーム３２^{2b}の運動の制御手段が異なる往復動アームシステム３^{2b}を有する変形例を示している。この変形例は歯付きプーリおよびベルトを有する制御手段の代わりに第１アームの回転中心３１Ｒ^{2b}に中心を置く駆動ピニオン３１１^{2b}を有する。

【００４６】図９は回転中心３１Ｒ^{2b}を介して往復動シャフトに取付けられた第１アーム（ベースアーム）３１^{2b}を示している。第１アーム３１^{2b}は回転中心３１Ｒ^{2b}の反対側に移送ヘッド３１Ｔ^{2b}を有し、第２アームの回転中心３２Ｒ^{2b}に関節接続された第２アーム３２^{2b}は第１アーム３１^{2b}の移送ヘッド３１Ｔ^{2b}に取付けられている。この第２アーム３２^{2b}は移送ヘッド３２Ｔ^{2b}を有し、案内管６はこれに直接取付けられている。駆動ピニオン３１１^{2b}はプレート（図９には図示せず）に固定されたフランジ３７^{2b}と一体化されている。従動ピニオン３１２^{2b}は第２アーム３２^{2b}と一体化されている（相対回転不可）。第１ピニオンと第２ピニオンとの間にはチェーン３６１^{2b}が掛けられている。第１ピニオンと第２ピニオンの直径は同一であり、第２アーム３２^{2b}は運動中各ピニオンと常に平行である。往復動アームシステム３^{2b}を図８の往復動アームシステム３^{2a}に代えることもできる。プレートとフランジ３７^{1b}との間の自由度を制御してプレートに対するフランジ３７^{1b}の相対位置を制御する可能性についての前記の説明はこのフランジ３７^{2b}および全ての類似のフランジに当てはまる。

【００４７】案内管６は全ての変形例で「運動面」とよばれる平面内を周期的に運動することを忘れてはならない。また、芯型１の予備被覆された面が補強コード４が配置される面の寸法が決定する。さらに、案内管６が案内管の運動面内で前後運動をする間に、芯型１はその軸線の周りを回転する。もちろん、芯型１のこの運動は案内管の前後運動と同期している。コード４のアーチ４０の真の軌跡は案内管の運動面と芯型の相対位置との関数であり、芯型１と案内管６の前後運動との相対運動の関数である。

【００４８】図１、４、７および８はラジアルタイヤ用のカーカス（またはカーカス部分）製造用のものであるため図１、４、７および８ではアーチ４０の軌跡はほぼ放射状であるが、もちろんこれに限定されるものではない。他の例が図１２に表した第３実施例に示してある。図１２ではアーチ４０^{3a}の軌跡は放射状でなく、ベルト補強材に対して一般に角度（約１５°～３０°）を成している。

【００４９】図１２に示した第３実施例は単一の往復動アーム（ベースアーム）３１^{3a}を有し、これは例えばタイヤのベルト内の補強材の製造に適しており、このシステムは例えばベルト補強材を製造するためのショルダー

からショルダーまでの運動に適している。ベースアーム３１^{3a}はその回転中心３１Ｒ^{3a}を介して往復動シャフトに取付けられている。ベースアーム３１^{3a}は移送ヘッド３１Ｔ^{3a}を有し、案内管６はこれに直接取付けられている。案内管６が前後運動する運動面は、タイヤ分野で角度を測定するための一般的な慣例に従っていうと、芯型１の回転軸線に垂直な面に対して約２０°の角度を成す。押圧装置２^{6}および２^{0}も同じ運動面内で運動する。図１２に示す実施例ではコード４は往復動シャフト３Ｄ^{3a}の中空中心部５１^{3a}を通っており、大きなコード補償システム５２^{3a}が上流側に設けられているが、この実施例に限定されれるものではない。

【００５０】サイドウォールにクロスプライを有するカーカスを製造するため、コード取付け部材の支持体（プレート３０等）を芯型１の回転軸に平行な軸線を中心として傾斜させて案内管の運動面を全くの放射方向から変えることもできる。の調整とベルト補強材の製造で説明した前記の調整法とを組み合わせることも可能である。前記の装置の部材の特徴を全く変えずにチェーンの速度と芯型の速度との関数のコード配置角度が得られるように芯型を大幅に高速（例えば往復動アームシステム３の前後運動に対して１／８の回転）で駆動することもできる（上記の全ての実施例では芯型１の速度は配置ピッチのみに関係するものである）。

【００５１】以下、さらに別の変形例を説明するが、これらは本明細書に記載の全ての実施例の全ての変形例に適用することができる。芯型１上でのコード４の取付け軌跡を変えるために、コード取付け部材の支持体（プレート３０^{1a}等、図１参照）に交互運動を与えることができる。例えば取付け部材の支持体を軸線方向交互運動（図１の２重矢印Ｐ参照）するように駆動して案内管の運動面が運動面に垂直な方向に軸線方向運動できるようにすることができる。取付け部材支持体を型の表面に垂直な幾何学軸線を中心として往復動運動（運動面内に含まれ、ベースアームの幾何学回転軸線（図１の軸Ｍ－Ｍの周りの２重矢印Ｑ参照）と交差する運動）するように駆動して、運動面を運動面に平行な軸線を中心とする往復動運動させることも可能である。コード取付け部材の支持体と平行な任意の軸線を中心として往復動運動するようにコード取付け部材の支持体を駆動することも可能である。この設計はプレート^{1a}３０を軸線ＭＭを中心とする一定角度の調整（これはある種の場合には可能で且つ有用である）とは区別することが重要である。これらの特定の実施例は全てコード４の軌跡の形そのものにさらに大きな自由度を与える。

【００５２】本発明の利点は従来公知の基本的方法を実施する装置の機構を単純化し、軽くすることができることと、簡単な調整だけで製造すべき広範囲のタイヤをカバーする全てのタイヤ補強材の変形例に適合することができることにある。本発明の往復動アームシステムは片持ち部分がなく、慣性部分がほとんど無く、運転速度を上げるに適している。複数（ｎ）のパス（各パスが芯型全体を被う）でカーカス補強材を製造することもできる。ピッチＰで放射状アーチを一つのパスで配置する場合、ｎ回の一連のパスで配置されるアーチ４０の芯型１上の位置はＰ／ｎに対応する位相で円周方向にシフトする。当業者はタイヤの所望構造に応じて本発明を種々の方法で用いることができるであろう。

【００５３】片側カーカスを製造する場合には（図８、図９参照）、芯型の各々の片側に本発明装置を設けることによって芯型の両側で同時に各片側カーカスを製造することができる。各片側カーカス片を順次製造することも可能である。本発明の一つの利点はアーチの軌跡が９０°とは非常に異なる角度（例えば約２０°）を成すものもを含めて複数の使用で型の輪郭を倣うことができることにある。この場合も、型に衝突しないで、タイヤビードの対応する各領域にある型の一連の２点に達することが可能である。

【図面の簡単な説明】

【図１】　本発明装置の第１実施例を示す概念的斜視図。

【図２】　上記装置の押圧装置の詳細図。

【図３】　第１実施例の第１変形例を示す図。

【図４】　第１実施例の装置の各操作段階の詳細図。

【図５】　図１に示されていない第１実施例の詳細図。

【図６】　第１実施例の第２変形例を示す図。

【図７】　第１実施例の第２変形例の一連の操作段階を示す図。

【図８】　本発明装置の第２実施例を示す放射方向断面図。

【図９】　第２実施例の変形例を示す図。

【図１０】　図１に示した第１実施例で用いられる制御機構の平面図（軸線ＭＭおよびシャフト３Ｄの幾何学軸線による図１で規定の面での断面、「中心面」ともよばれる）。

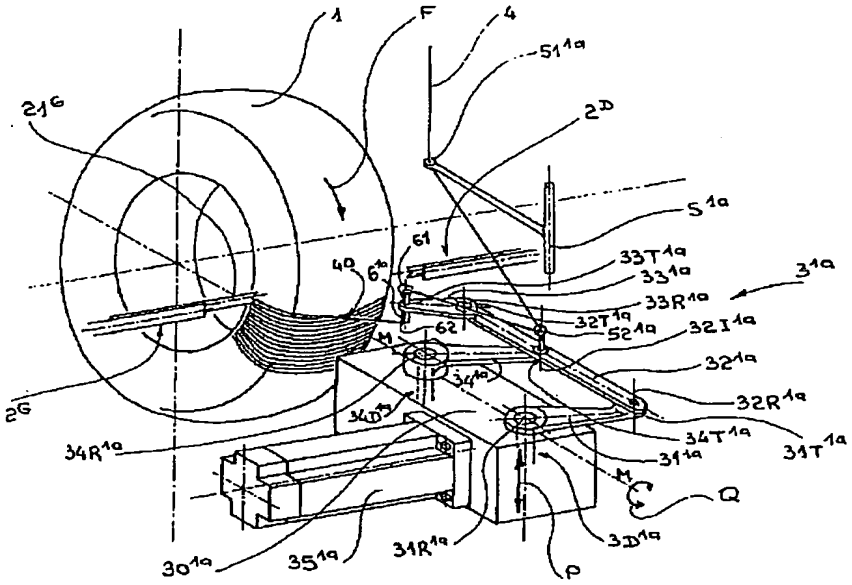
【図１１】　図１０のＡ－Ａ線に沿った断面図。

【図１２】　本発明装置の第３実施例を示す概念的斜視図。

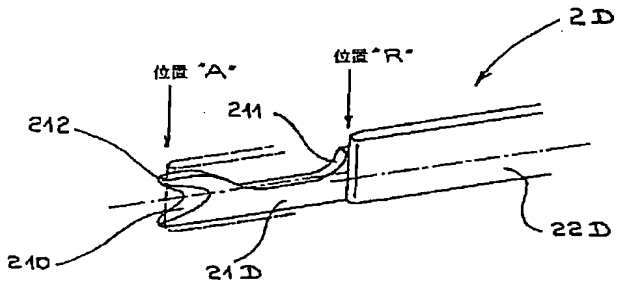
【符号の説明】

１	芯型
２	押圧装置
４	コード
６	案内部材
３１	ベースアーム
３１Ｔ	移送ヘッド
３１Ｒ	回転中心
３１１	駆動プーリ
３１２	従動プーリ

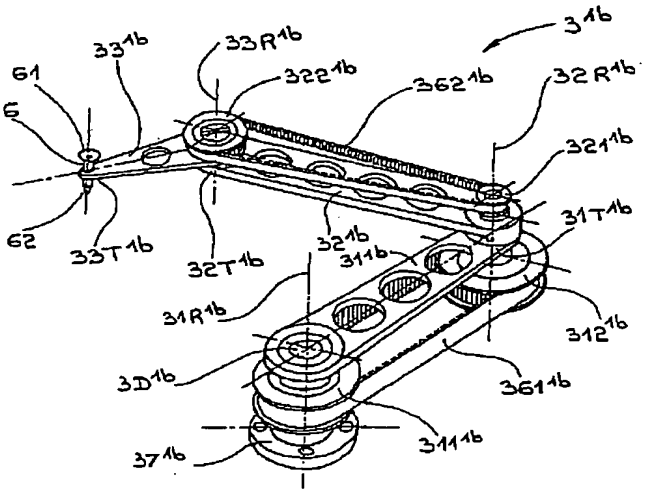
【図１】


1
F
4
51 1a
21G
2D
S 1a
61
40
6
33T 1a
33 1a
31a
33R 1a
62
32T 1a
52 1a
32I 1a
32 1a
34 1a
32R 1a
36 1a
34T 1a
31T 1a
34R 1a
31 1a
M
Q
2G
30 1a
35 1a
31R 1a
3D 1a
P

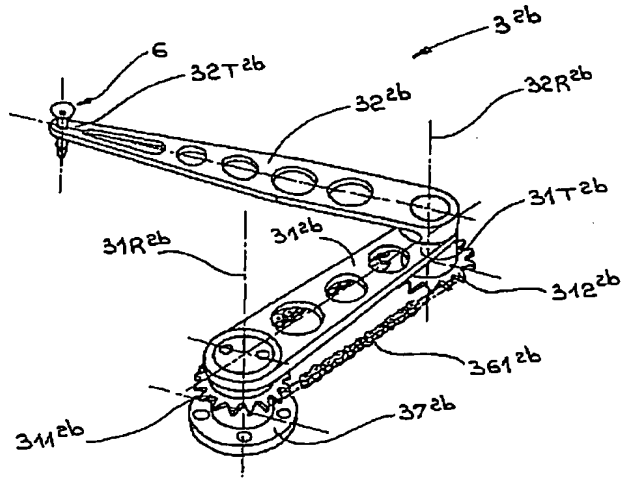
【図２】


2D
位置 "A"
位置 "R"
212
211
210
21D
22D

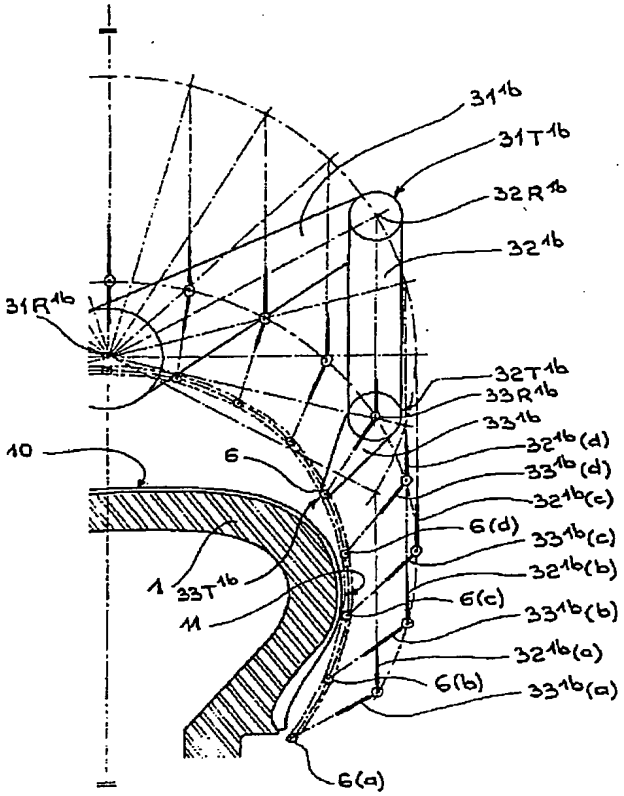
【図３】


3 1b
33 1b
33R 1b
61
32E 1b
362 1b
32R 1b
6
321 1b
31T 1b
62
33T 1b
32T 1b
32 1b
311b
31R 1b
312 1b
3D 1b
361 1b
37 1b
311 1b

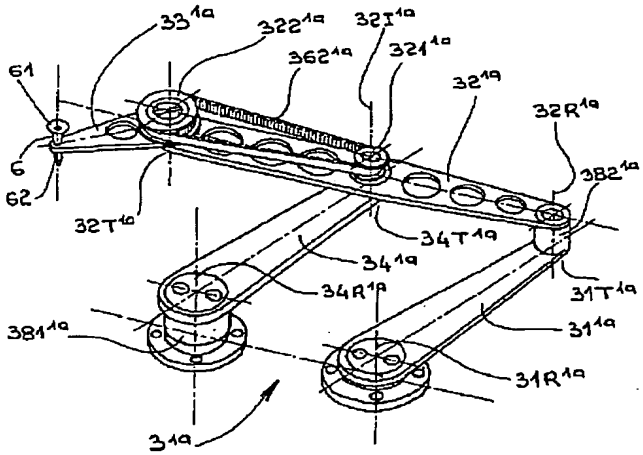
【図９】


3 2b
6
32T 2b
32 2b
32R 2b
31T 2b
31R 2b
312b
312 2b
361 2b
311 2b
37 2b

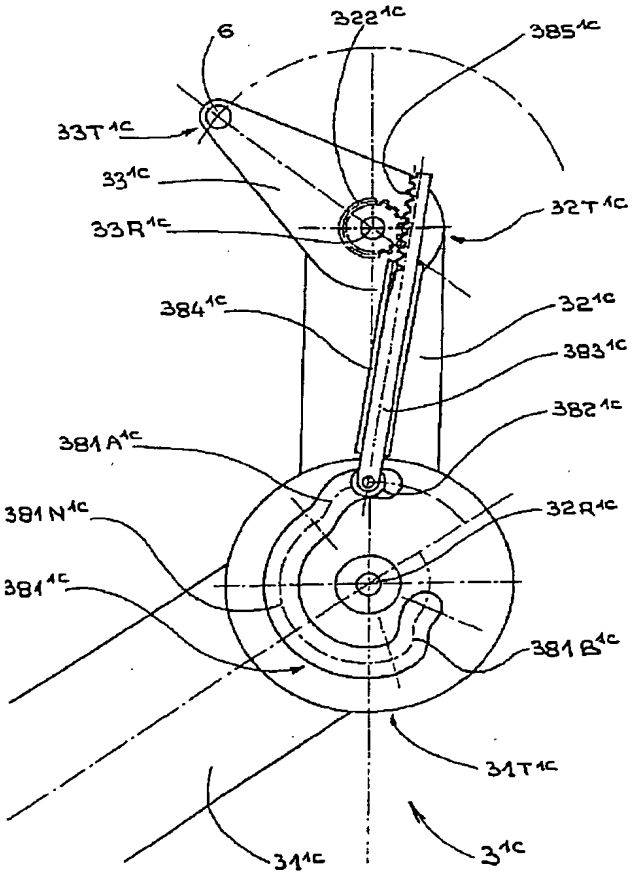
【図４】


31^1b
31T^1b
32R^1b
32^1b
31R^1b
32T^1b
33R^1b
33^1b
10
6
32^1b(d)
33^1b(d)
32^1b(c)
6(d)
33^1b(c)
1
33T^1b
32^1b(b)
11
6(c)
33^1b(b)
32^1b(a)
6(b)
33^1b(a)
6(a)

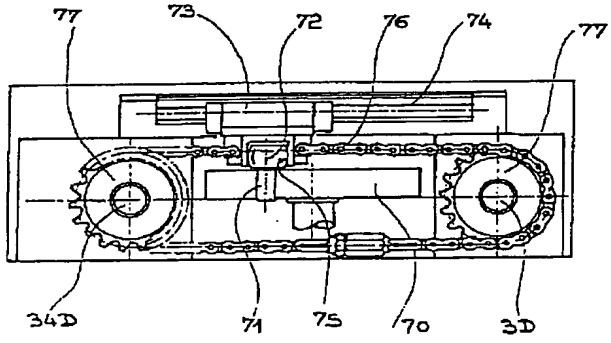
【図５】


33^1a
322^1a
32I^1a
362^1a
321^1a
61
32^1a
6
32R^1a
382^1a
62
32T^1a
34T^1a
34^1a
34R^1a
31T^1a
381^1a
31^1a
31R^1a
3^1a

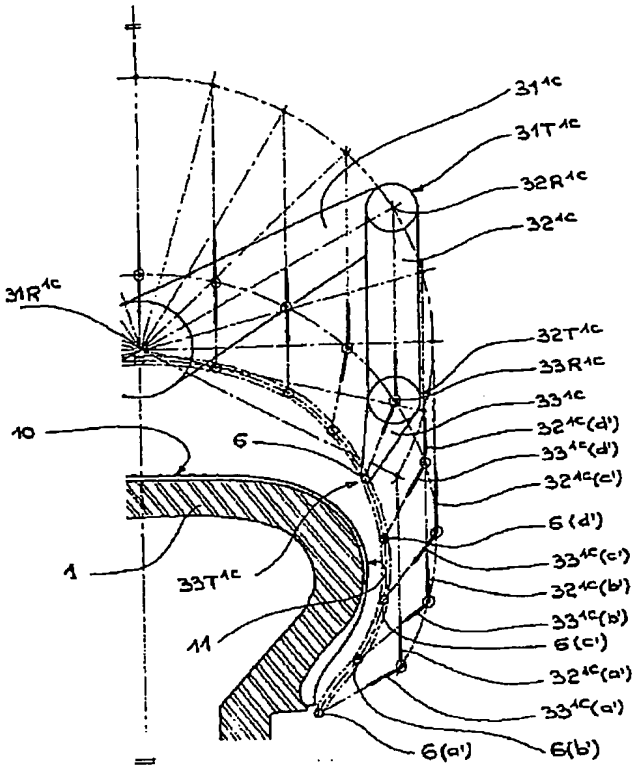
【図６】


322^1c
385^1c
6
33T^1c
33^1c
32T^1c
33R^1c
384^1c
32^1c
383^1c
382^1c
381A^1c
381N^1c
32R^1c
381^1c
381B^1c
31T^1c
31^1c
3^1c

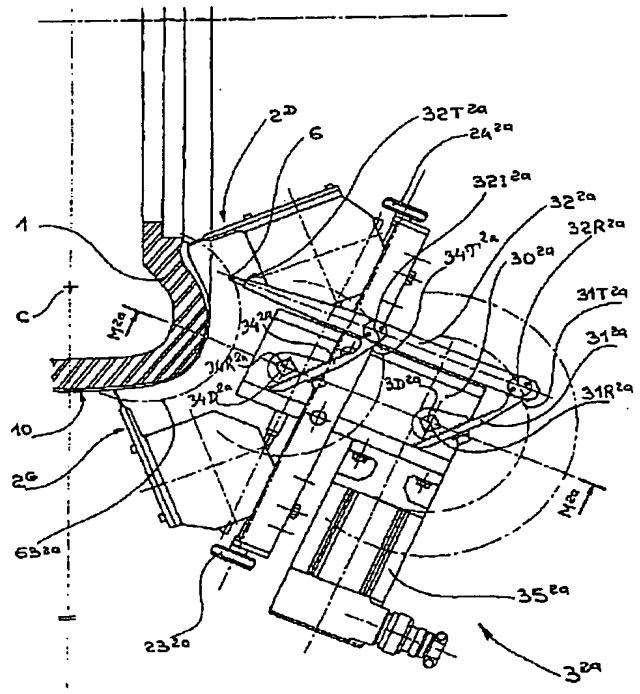
【図１１】


77
73
72
76
74
77
34D
71
75
70
3D

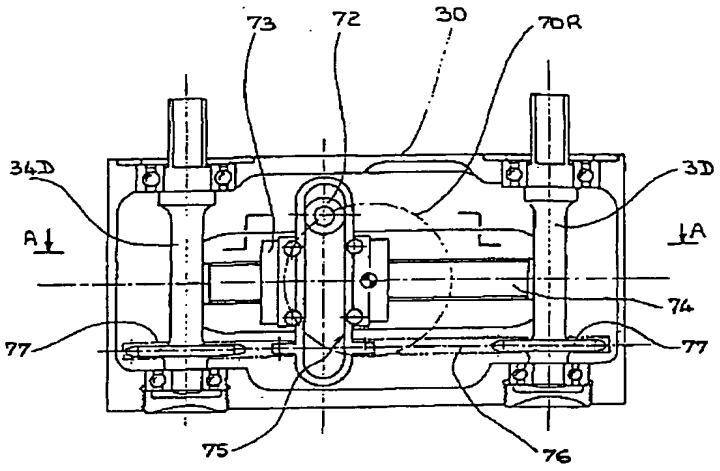
【図７】


31^1C
31T^1C
32R^1C
32^1C
31R^1C
32T^1C
33R^1C
33^1C
32^1C(d')
33^1C(d')
32^1C(c')
6(d')
33^1C(c')
32^1C(b')
33^1C(b')
6(c')
32^1C(a')
33^1C(a')
6(a')
6(b')
10
6
1
33T^1C
11

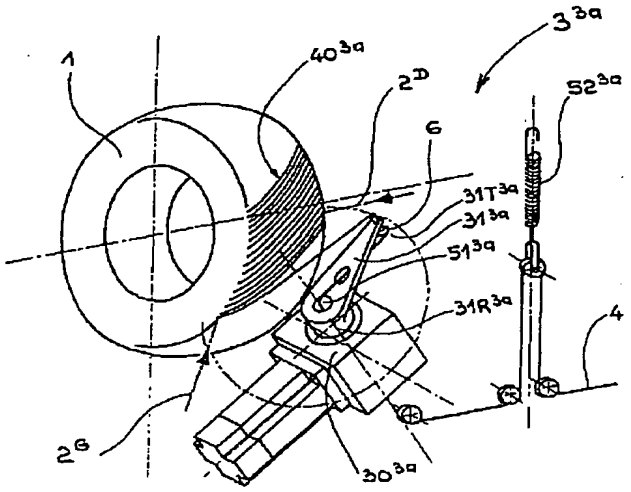
【図８】


2^2D
6
32T^2a
24^2a
321^2a
32^2a
32R^2a
34T^2a
30^2a
31T^2a
31^2a
31R^2a
1
C
M2a
34^2a
34R^2a
34D^2a
3D^2a
10
2G
65^2a
M2a
35^2a
23^2a
3^2a

【図１０】


73
72
30
70R
34D
3D
A
A
74
77
77
75
76

【図１２】


1
40 3a
2 D
3 3a
52 3a
6
31T 3a
31 3a
51 3a
31R 3a
4
2 G
30 3a

【外国語明細書】

1. Title of Invention

OSCILLATING ARM APPARATUS, FOR MANUFACTURING A REINFORCEMENT FROM A SINGLE CORD.

2. Claims

1. An apparatus for manufacturing a tyre reinforcement, said apparatus being intended for manufacturing a reinforcement constituted from a cord (4) supplied continuously and on demand by a suitable distributor, said apparatus being intended for use in cooperation with a substantially toroidal form on which said reinforcement is built up progressively by laying down arches of said cord, according to a desired trajectory for said cord, on the surface of said form,
said apparatus comprising:

- a guide member (6) in which the cord may slide freely,
- means of displacing said guide member in a cyclical, to-and-fro, movement, to bring said guide member in successive cycles into the vicinity of each of the desired ends for the cord in said trajectory,
- pressers (2) close to each end of said trajectory, for applying the cord (4) onto the form at said ends,

characterised in that:

- the displacement means comprises at least one base arm (31), said base arm comprising a centre of rotation (31R) and a conveying head (31T), and control means for imparting to said base arm an oscillatory movement about said centre of rotation, the apparatus being arranged so that the conveying head (31T) of said base arm directly or indirectly conveys the guide member from one end to the other of said trajectory,
- the geometric axis of said centre of rotation is, in the working position, entirely exterior to the form.

2. An apparatus according to claim 1, in which the conveying head (31T) of the base arm (31) directly supports said guide member (6).

3. An apparatus according to claim 1, comprising a second arm (32), articulated by a centre of rotation (32R) of the second arm, said centre of rotation of the second arm being mounted on said conveying head (31T) of said base arm, said second arm having a conveying head (32T) for directly or indirectly conveying the guide member from one end to the other of said trajectory, and comprising control means for controlling the relative position of the second arm relative to said base arm.

4. An apparatus for manufacturing a tyre reinforcement, said apparatus being intended for manufacturing a reinforcement constituted from a cord supplied continuously and on demand by a suitable distributor, said apparatus being intended for use in cooperation with a substantially toroidal form on which said reinforcement is built up progressively by depositing arches of said cord according to a desired trajectory for said cord on the surface of said form,
said apparatus comprising:

- a guide member in which the cord may slide freely,
- means of displacing said guide member in a cyclical, to-and-fro, movement, to bring said guide member in successive cycles into the vicinity of each of the desired ends for the cord in said trajectory,
- pressers close to each end of said trajectory, for applying the cord onto the form at said ends,

characterised in that the displacement means comprise at least two arms, i.e. an oscillating base arm and at least one other oscillating arm, said at least two arms each comprising a centre of rotation and a conveying head, said at least two arms each oscillating about a geometric axis of rotation, said geometric axis of rotation being parallel to each other, and control means for imparting to said arms oscillatory movements about the respective geometric axes of rotation thereof, the apparatus being arranged so that the conveying head of said base arm conveys the centre of rotation of a second oscillating arm and so that the conveying head directly or indirectly conveys the guide member from one end to the other of said trajectory, the apparatus comprising control means for controlling the relative position of the second arm relative to said base arm.

5. An apparatus according to claim 3 or claim 4, in which said control means for controlling the relative position of the second arm (32) relative to the base arm (31) essentially comprise a drive pulley (311) centred on the centre of rotation of said base arm, the angular position of said drive pulley being controlled independently of the oscillation control of said base arm, and comprise a driven pulley (312) firmly connected with said second arm, a toothed belt (361) connecting said pulleys.

6. An apparatus according to claim 5, in which said drive pulley (311) is stationary in space.

7. An apparatus according to claim 1, comprising a second oscillating arm (32), the centre of rotation (32R) of the second arm being mounted at the conveying end (31T) of said base arm, said second arm having a conveying head (32T) for directly or indirectly conveying the guide member from one end to the other of said trajectory, and comprising an auxiliary arm (34) oscillating about a centre of rotation (34R), the geometric axis of rotation of said centre of rotation of the auxiliary arm being situated entirely exterior to the surface of the form, between the latter and the geometric axis of rotation of said base arm, said auxiliary arm having a conveying head (34T), said second arm having an intermediate centre of rotation (32I) between the centre of rotation (32R) of the

second arm and the conveying head (32T) of said second arm, said intermediate centre of rotation being articulated on the conveying head (34T) of said auxiliary arm.

8. An apparatus according to claim 3, 4 or 7, in which the conveying head (32T) of the second arm directly supports said guide member (6).

9. An apparatus according to one of claims 3 to 7, comprising a third oscillating arm (33), articulated by its centre of rotation (33R) to the conveying head (32T) of the second arm, said third arm having a conveying head (33T) for conveying the guide member directly or indirectly from one end to the other of said trajectory, and comprising control means for controlling the relative position of the third arm relative to the second arm.

10. An apparatus according to claim 9, in which the conveying head (33T) of the third arm directly supports said guide member (6).

11. An apparatus according to claims 9 and 5 or 10 and 5, in which said control means for controlling the relative position of the third arm relative to the second arm essentially comprise a drive pulley (32I) centred on the centre of rotation (32R) of said second arm, said drive pulley being firmly connected with the base arm (31), and comprise a driven pulley (322) firmly connected with said third arm (33) at the centre of rotation thereof, a toothed belt (362) connecting said drive and driven pulleys.

12. An apparatus according to claims 9 and 7 or 10 and 7, in which said control means for controlling the relative position of the third arm relative to the second arm essentially comprise a drive pulley (321) centred on the intermediate centre of rotation (32I) of said second arm, said drive pulley being firmly connected with the intermediate arm (34), and comprise a driven pulley (322) firmly connected with said third arm (33) at the centre of rotation thereof, a toothed belt (362) connecting said drive and driven pulleys.

13. An apparatus according to claim 9 or 10, in which said control means for controlling the relative position of the third arm relative to the second arm essentially comprise a cam arranged in the conveying head of the base arm, a toothed wheel firmly connected with the third arm, a connecting rod guided in sliding manner with regard to the second arm, carrying on one side a cam follower cooperating with said cam and on the other a rack engaged on said toothed wheel.

14. An apparatus according to one of claims 1 to 13, comprising a support for the means of displacing said guide member and comprising means of imparting to said support an alternating movement allowing deflection of the trajectory of the cord (4) on the core (1).

3. Detailed Description of Invention

The present invention relates to the manufacture of tyres. More precisely, it relates to the depositing of cords to constitute a tyre reinforcement. More particularly, it proposes means suitable for manufacturing such a reinforcement on a form similar or identical to the form of the internal cavity of the tyre, that is to say a substantially toroidal form, supporting the tyre blank during manufacture thereof.

In this technical field, processes and apparatus are already known which permit incorporation of the manufacture of the tyre reinforcements into assembly of the tyre itself. This means that, rather than having recourse to semi-finished products, such as reinforcement plies, one or more reinforcements are produced in situ, at the time of manufacture of the tyre, from a cord spool. Of these processes and apparatus, the solution described in patent application EP 0 580 055 is most particularly adapted to the production of carcass reinforcements on a rigid core, the outer surface of which corresponds substantially to the form of the internal cavity of the finished tyre. This patent application discloses equipment in which the cord, intended to constitute a carcass reinforcement, is laid down in contiguous arches on a rigid core, via an eyelet fixed on a chain mounted on pulleys in such a way as to surround the core by forming a type of fork. The eyelet performs a to-and-fro movement around the core in such a way as progressively and contiguously to lay down an arch with each outward movement and an arch with each return movement, suitable pressers being used to apply the ends of said arches as they are formed on the rigid core pre-coated with uncured rubber.

The object of the present invention is to provide equipment variants for depositing a reinforcing cord on a core in substantially the same manner.

The invention proposes an apparatus for manufacturing a tyre reinforcement, said apparatus being intended for manufacturing a reinforcement constituted from a cord supplied continuously and on demand by a suitable distributor, said apparatus being intended for use in cooperation with a substantially toroidal form on which said reinforcement is built up progressively by laying down arches of said cord, according to a desired trajectory for said cord, on the surface of said form, said apparatus comprising:

- a guide member in which the cord may slide freely,
- means of displacing said guide member in a cyclical, to-and-fro, movement, to bring said guide member in successive cycles into the vicinity of each of the desired ends for the cord in said trajectory,
- pressers close to each end of said trajectory, for applying the cord onto the form at said ends,

characterised in that:

- the displacement means comprises at least one base arm, said base arm comprising a centre of rotation and a conveying head, and control means for imparting to said base arm an oscillatory movement about said centre of rotation, the apparatus being arranged so that the conveying head of said base arm directly or indirectly conveys the guide member from one end to the other of said trajectory,
- the geometric axis of said centre of rotation is, in the working position, entirely exterior to the form.

The reader is invited to refer to the above-cited patent application EP 0 580 055, since the present invention includes not only the process described therein but also to a considerable extent the pressers used to allow formation of a loop and to apply said loop against the core. By way of a reminder, the pressers essentially each comprise a fork and a hammer. Apart from a few details, the presser embodiment described therein could be used as it is, even if a novel form is proposed below for said pressers.

The main differences provided by the invention lie in the cord depositing members and more precisely the actuation of said guide member in which the cord may slide freely (i.e. the eyelet). In other words, the oscillating arm system or systems described below are designed to be able to replace the chain system described in the above-cited patent.

Before embarking on a detailed description of these novel means of actuating the cord guide member, it would be helpful to remember certain useful points.

First of all, it should be noted that, as in the above-cited patent, the term "cord" must of course be understood in a completely general sense, covering a monofilament, a multifilament, an assembly such as for example a cable or a plied yarn, or a small number of grouped cables or plied yarns, whatever the nature of the material and whether or not the "cord" is pre-coated with rubber. In the present specification, the term "arch" is used to designate a portion of cord extending from a singular point to another in the reinforcement armature. All these arches disposed over the entire periphery of the tyre form the reinforcement proper. An arch as defined here may be part of a carcass or of a crown reinforcement or of any other type of reinforcement. These arches may be separated by cutting the cord during laying thereof, or they may all be connected together in the finished reinforcement, for example by loops.

Basically, the invention relates to continuous layion of a reinforcing cord, in a configuration as close as possible to the configuration in the finished product. Since the cord is supplied on demand by a suitable distributor comprising for example a cord spool and, if applicable, a device for controlling the tension of the cord withdrawn from the spool, the apparatus for manufacturing a reinforcement from a cord cooperates with a form (rigid core or reinforced membrane) on which

the tyre is manufactured. It is of little significance whether the reinforcement, to be complete, is fabricated in several successive passes of the depositing members described with or without cutting of the cord between two passes.

When positions or directions are defined by the words "radially, axially, circumferentially" or when radii are mentioned, the reference point is taken to be the core on which the tyre is manufactured, or the tyre itself, which comes to the same thing. The geometric axis of reference is the axis of rotation of the form.

Likewise, as has already been pointed out in the above-cited patent, the cord depositing members described here also allow the production of a reinforcement, for example a carcass reinforcement, in which the laying pitch of the cord is variable. "Laying pitch" is understood to mean the distance resulting from the sum of the space between two adjacent cords and the diameter of the cord. It is well known that, for a carcass reinforcement, the space between cords varies according to the radius at which it is measured. This is not the variation referred to here, which is a variable pitch at a given radius. For this, it is sufficient to vary the speed of rotation of the form as a function of any suitable law without changing the working speed of the guide member. A tyre is thus obtained, the carcass reinforcing cords of which, for example for a radial carcass, are disposed at a pitch exhibiting controlled variation for a given radial position.

Various embodiments of the invention may be envisaged. Three main embodiments will be described below. The first embodiment uses a series of three functional oscillating arms. In addition, possible variants are described for this first embodiment. A series of three functional oscillating arms is preferably used for depositing carcass arches extending from one bead to the other of the tyre. The second embodiment uses a series of two functional oscillating arms. Furthermore, a variant embodiment is given for this second embodiment. A series of two functional oscillating arms is used for example for depositing carcass arches extending from a bead to a shoulder of the tyre. The third embodiment uses a single functional oscillating arm, which is sufficient for the simplest laying down to be performed.

When "n" functional oscillating arms are used which are arranged in series ($n > 1$), the term "n^{th} arm" is used to designate the functional oscillating arm to which the cord guide member is directly fixed, the base arm always being the "first oscillating arm". The oscillating arms are arranged in series in such a way that, in general, the conveying head of the oscillating arm "p" (p being $< n$) conveys the centre of rotation of the oscillating arm "$p + 1$". This is why it is stated above that the conveying head conveys the cord guide member directly, or only "indirectly" (that is to say through the intermediary of one or more other functional oscillating arms). In all the examples described, the geometric axis of the centre of rotation of the first oscillating arm is, in the working position, entirely exterior to the form, with which it never comes into contact, that is to say not

even via its extensions.

The apparatus causes the cord guide member to describe a movement which is substantially included in a plane - the plane of movement - perpendicular to the geometric axis of rotation of the base arm. In another aspect of the apparatus according to the invention, the base arm, or according to the variants, each of the oscillating arms used, is of planar, long-limbed appearance, and the base arm oscillates in this plane of movement, or all the oscillating arms move in parallel, neighbouring planes, one of them being very close to this plane of movement, or even merged with this plane of movement, depending on the type of guide member used.

It should also be pointed out that, in another aspect, and without taking account of the respective position of the series of oscillating arms with respect to the form, the invention proposes an apparatus for manufacturing a tyre reinforcement comprising a series of arms articulated with one another, the articulations being perpendicular to the plane of movement. Said apparatus, intended for manufacturing a reinforcement constituted from a cord supplied continuously and on demand by a suitable distributor and intended for use in cooperation with a substantially toroidal form on which said reinforcement is built up progressively by depositing arches of said cord according to a desired trajectory for said cord on the surface of said form, comprises:

- a guide member in which the cord may slide freely,
- means of displacing said guide member in a cyclical, to-and-fro, movement, to bring said guide member in successive cycles into the vicinity of each of the desired ends for the cord in said trajectory,
- pressers close to each end of said trajectory, for applying the cord onto the form at said ends,

characterised in that the displacement means comprise at least two arms, i.e. an oscillating base arm and at least one other oscillating arm, said at least two arms each comprising a centre of rotation and a conveying head, said at least two arms each oscillating about a geometric axis of rotation, said geometric axis of rotation being parallel to each other, and control means for imparting to said arms oscillatory movements about the respective geometric axes of rotation thereof, the apparatus being arranged so that the conveying head of said base arm conveys the centre of rotation of a second oscillating arm and so that the conveying head of the second oscillating arm directly or indirectly conveys the guide member from one end to the other of said trajectory.

The rest of the description allows a full understanding of all the aspects of the invention, on the basis of the Figures.

Figure 1 (as moreover for all the examples described, without this being limiting however) shows that the form is a core 1 (rigid and dismantlable) defining the geometry of the inner surface of the

tyre. This is coated with rubber 10 (see Figure 7), for example a butyl rubber-based sealing rubber layer and a rubber layer ensuring coating of the carcass cords. The rubber 10 covering the core 1 allows a cord 4 to be held on the core 1 as it is deposited thereon, by an adhesive effect. Of course, the core 1 is driven rotationally by any suitable device, not shown.

The depositing members proper essentially comprise a system of oscillating arms 3^{1a} on the one hand and presser devices 2^G and 2^D on the other. With regard to the reference numerals in the Figures, the convention used is to designate similar members with the same main reference numerals, for example "3" for the system of oscillating arms, and to indicate specific association with an embodiment or a variant by an exponent, for example "^{1a}" for the first embodiment (using a series of three oscillating arms), in its variant "a". A reference numeral without any specific marker relates to a member which is always the same in the different variants or should be understood as designating without distinction all the variants of all the embodiments.

In the first embodiment shown in Figure 1, the system of oscillating arms 3^{1a} comprises three functional oscillating arms 31^{1a}, 32^{1a}, 33^{1a} arranged in series and an auxiliary arm 34^{1a}. This arrangement with three functional oscillating arms allows easy displacement of the guide member from one bead to the other and thus the obtainment, in conjunction with the presser devices 2^G and 2^D, of operation of the apparatus from one bead to the other. An eyelet 6 constitutes in all the examples described here the materialisation of the guide member for the cord 4 (without being limiting). The eyelet is always mounted on the last oscillating arm. Before going into detail, it should simply be pointed out that the system of oscillating arms 3 fulfils the function fulfilled by the chain system in above-cited patent application EP 0 580 055, and the presser devices 2^G and 2^D are positioned in a suitable manner to play the role described in the above-cited patent application EP 0 580 055.

The system of oscillating arms 3^{1a} is mounted on a plate 30^{1a} and causes the eyelet 6^{1a} to describe a movement flying over the core 1, and even passing round it in many embodiments. In all scenarios, the system of oscillating arms 3 causes the eyelet 6 to perform a movement in a plane. The eyelet 6 is flared: it forms a funnel with a large opening 61 on the side on which the cord 4 arrives and a smaller orifice 62 on the side on which the cord 4 exits (see also Figure 3). It is the small orifice 62 which describes a movement in said plane of movement of the guide member. It is a good idea to take care over production of the edges of the orifice 62, so as not to damage the cord 4, since the outlet portion thereof is generally arranged substantially in the plane of movement, that is to say in a plane which is perpendicular to the guide direction imposed by the eyelet 6. As a variant, it is possible to orient the eyelet in such a way as to resemble the average orientation of the cord when leaving the eyelet.

The plate 30^{1a} comprises an oscillating shaft $3D^{1a}$ (see also 3D in Figures 10 and 11) motorising the system of oscillating arms, the geometric axis of said oscillating shaft $3D^{1a}$ being situated radially outside the core 1. In other words, the geometric axis of said oscillating shaft $3D^{1a}$ is situated beyond the surface of the core 1, without the extension thereof coming into contact with the core 1. Said oscillating shaft $3D^{1a}$ does not effect continuous rotation, but rather oscillates within the limits of an arc smaller than 360°, the precise value depending on the exact constitution of the system of oscillating arms 3 and the intended use.

The entire oscillating arm system 3 itself is quite compact. All the depositing members, i.e. the oscillating arm system 3 and the presser devices 2, including the motor and the drive mechanism, form a sub-assembly capable of being easily presented to the core in a suitable manner, and capable of being retracted so that, for example, other devices may be presented to the core which are used for manufacture of a tyre or for removal of the core to other tyre building stations.

A base arm (or first arm) 31^{1a} (Figure 1) is mounted on the oscillating shaft $3D^{1a}$ via a centre of rotation $31R^{1a}$. The first arm 31^{1a} comprises a conveying head $31T^{1a}$ at the opposite end from the centre of rotation $31R^{1a}$. A second arm 32^{1a}, articulated by a centre of rotation $32R^{1a}$ of the second arm, is mounted on the conveying head $31T^{1a}$ of the first arm 31^{1a}. This second arm 32^{1a} comprises a conveying head $32T^{1a}$. So as to control the relative position of the second arm 32^{1a} relative to the first arm 31^{1a}, in this example a parallelogram is formed by means of an auxiliary arm 34^{1a}, mounted oscillatingly about an oscillating shaft $34D^{1a}$ via the centre of rotation $34R^{1a}$ thereof. The centre of rotation $34R^{1a}$ is situated radially outside the surface of the core 1, and radially between the latter and the centre of rotation $31R^{1a}$ of the first arm 31^{1a}. The auxiliary arm 34^{1a} comprises a conveying head $34T^{1a}$, articulated to the second arm 32^{1a} which comprises to this end an intermediate centre of rotation $32I^{1a}$ situated between the centre of rotation $32R^{1a}$ and the conveying head $32T^{1a}$ of said second arm 32^{1a}.

It should be noted that it is not necessary for the singular points constituting the centres of rotation $31R^{1a}$, $34R^{1a}$ and the conveying heads $31T^{1a}$, $34T^{1a}$ to form a parallelogram. These points are preferably precisely aligned as they pass through the median position in the median plane, defined by the axis MM joining the centres of rotation $31R^{1a}$, $34R^{1a}$ and by the geometric axis of the shaft 3D (as well as by the geometric axis of the shaft $34D^{1a}$ which is naturally parallel with the former). In this way, the eyelet 6 describes a movement, the course of which is symmetrical with regard to this median plane, and it reaches the vicinity of each of the bead zones defined on the core 1 in a perfectly symmetrical movement, even in the control thereof. This does not of course exclude the ends of the eyelet movement from not being at symmetrical points relative to the median plane, for example for manufacturing a tyre, the trajectory of the arches of which is not symmetrical. This would be the case in the manufacture of a tyre whose diameters at the seat (usual term for

designating the mounting seat) of each of the beads are different.

Finally, the apparatus comprises a third arm 33^{1a}, articulated via its centre of rotation $33R^{1a}$ to the conveying head $32T^{1a}$ of the second arm 32^{1a}. This third arm 33^{1a} comprises a conveying head $33T^{1a}$, on which the eyelet 6 is directly mounted. Below, with the aid of Figure 5, the control means will be described for the relative position of the third arm 33^{1a} with regard to the second arm 32^{1a}, not shown in Figure 1 so as not to overload the drawing. It should simply be noted, at this stage, that the use of such a third oscillating arm, mobile relative to the second oscillating arm, assists in advancing towards the beads the conveying end directly supporting the eyelet 6, that is to say assists in passing round the wall of the core 1 with regard to the centre of rotation of the first arm, to arrive at zones hidden by said wall, undercut relative to the radial viewing direction. Finally, it should be pointed out that the relative orientation of the third arm 33^{1a} relative to the second arm 32^{1a} allows good visualisation of the degree of functional freedom between said arms.

A motor 35^{1a} controls movement of all the arms 31^{1a}, 32^{1a}, 33^{1a}, 34^{1a}, preferably by motorisation of the two shafts $3D^{1a}$ and $34D^{1a}$, as explained in detail by means of Figures 10 and 11. The motor 35^{1a} drives a disk 70 rotationally. A shaft 71 is mounted in the disk 70, in a predetermined eccentric position. The shaft 71 supports a roller 72. A carriage 73 moves translationally on slides 74 formed on the casing of the plate 30^{1a}. The carriage 73 comprises a rectilinear slot 75, oriented perpendicularly to the direction of translation of the carriage 73 on the slides 74. A chain (with tension device) 76 is mounted on two identical pinions 77, and connected by its ends to the carriage 73. One of the identical pinions 77 is fixed to the shaft 3D and the other to the shaft 34D.

Assuming that the motor 35 imparts a rotational movement at constant speed to the control shaft 350, the roller 72 performs a circular movement 70R at constant speed. This being so, the roller 72 ascends and descends in the slot 75 and moves the carriage 73 translationally, thus converting a constant speed rotational movement into an alternating, linear to-and-fro movement, the speed of which varies sinusoidally. Through the intermediary of the chain 76 and the identical pinions 77, this alternating linear movement is converted at the shafts 3D and 34D into oscillations sweeping through an arc smaller than 360°. The amplitude of the oscillation may be adjusted by adjusting the radius at which the shaft 71 (thus the roller 72) is mounted eccentrically on the disk 70. It is of course possible to superimpose on the law of movement conversion thus created mechanically any control law specific to the rotation of the rotor of the motor 35.

Let us return to the explanation of Figure 1. A cord 4 is supplied via a spool (not shown) and is then wound onto a feed device 5^{1a} allowing the cord 4 to be fed and presented correctly to the depositing members. The feed device 5^{1a} preferably comprises means ensuring control of the tension of the cord 4 and, if applicable, the necessary compensation between the depositing

members 3^{1a} and the spool, owing to the fact that the cord is adjusted by said depositing members to a cyclically variable speed, which may even be negative. The cord 4 is threaded into a first ring 51^{1a} disposed at some distance from the plane of movement, in which the eyelet 6 performs its cyclical movement. The ring 51^{1a} is disposed in a median manner with respect to the core 1. The cord 4 is then threaded into a ring 52 fixed to the second arm 32^{1a}.

This cord 4 is threaded onto an eyelet 6. The eyelet 6 describes a to-and-fro movement from one bead to the other, or more precisely from a location close to one bead to a location close to the other bead. The basic functioning cycle of the apparatus according to the invention comprises the following stages:

- with the cord being held against the form for a sufficient time, moving the eyelet (guide member) in an eyelet movement plane as far as a first end,
- applying the cord to the form at this first end and holding it there for at least a sufficient time, by means of a presser device,
- repeating the first stage in the opposite direction as far as a second end,
- applying the cord to the form at this second end and holding it there, by means of another presser device,

and thus repeating this basic cycle until the desired number of arches is deposited on the surface of the form, along the desired trajectory for the cord 4 on the surface of the form, by moving the form in synchronism with the movement of the guide member.

Figure 2 shows more particularly the presser 2^{D} which comprises a fork 21^{D} and a hammer 22^{D}, both of these being movable between a retracted position, at R (position remote from the core 1), and an advanced position, at A. Dash-dotted lines are used to show the hammer in the advanced position. With regard to the reference numerals in the Figures, the convention used is to designate each of the presser members with a main reference numeral, for example "21" for the fork, and to indicate specific association with the presser on one side (the left- or right-hand side in Figure 1), respectively by the letter "^{G}" (left) or "^{D}" (right) positioned as an exponent. A reference numeral without any specific marker relates in generic manner without distinction to one or other of the pressers or their members.

The reader is again invited to refer to the appropriate part of the description of the above-cited patent application EP 0 580 055, to remind him/herself of the respective functions of the fork and hammer 22, and to remind him/herself of the respective roles of the positions stated as advanced A and retracted R. Figure 2 shows that both the fork 21 and the hammer 22 have the appearance of parallel blades. With respect to the hammer, the fork 21 is always disposed radially on the side of the axis of rotation of the core 1. The fork 21 has a V-shaped head 210, allowing the cord 4 to be taken up and centred. During the gripping phase, the plane formed by the "V" is disposed

perpendicularly to the cord 4. When the cord 4 has to be arranged radially, as in Figure 1, the blade forming the fork 21 is oriented at a tangent to a circle concentric with the core 1. The fork 21 also comprises a recess 211, the role of which will become apparent below.

It is known that the fork 21 is intended to bring the cord 4 against the core 1. To this end, the advancing movement thereof towards the core 1 is initiated when the eyelet 6 has brought the cord 4 to one end of the to-and-fro movement, that is to say when the apparatus is substantially in the configuration in Figure 4. The fork 21 stops when it has anchored the cord in the rubber coating the core 1. Said fork 21 thus allows the cord 4 to be deposited with sufficient force for it to adhere correctly at the desired location. Returning to Figure 1, and taking into account the laying pitch desired, which is itself a function of the rotational movement of the core 1 shown schematically by the arrow F, continuation of the movement of the system of oscillating arms 3 causes the formation of a loop around the tip 212, which begins the laying down of a new arch 40 on the core 1 (see Figure 1). And passage of the eyelet 6 beyond the fork 21 during the return phase is permitted by the recess 211, although the fork 21 is positioned against the core 1 in this manufacturing stage. It should be pointed out that the size of the loop is a function of the dimensions of the tip 212.

The hammer 22 acts after the fork 21 and after the "return" phase of the eyelet 6. The hammer 22 presses on the cord 4 at a slightly higher radial position. Preferably it continues to hold the cord 4 while the fork 21 is retracted. The hold provided by the hammer during retraction of the fork assists in preventing the fork 21 from taking with it the loop of cord 4 which has formed about one of its tips 212 and which, even if it is stuck to the rubber, could have a tendency to remain attached to the fork. Anchoring of the cord 4 in the bead is thereby made perfectly reliable.

Of course, switching into the advanced position, and the return to the retracted position, are controlled, both for the fork 21 and the hammer 22, in synchronism with the system of oscillating arms 3^{1a}, by any suitable device (return movement of the shaft 3D by a suitable mechanical transmission, for example using belts or cables, or by electrical synchronisation between a plurality of motors). Hereinafter, such a device or its equivalent is simply shown schematically by an arrow and designated by reference numeral 2, it being understood that said numeral designates wholly generally a device with two acting elements, such as a fork and a hammer, acting in sequence on the cord 4.

Figure 3 shows a variant of the same first embodiment, comprising a system of oscillating arms 3^{1b}, differing from that described above essentially in the means of controlling the movement of the second arm 32^{1b} with regard to the base arm (or first arm) 31^{1b}. In this variant of the first embodiment, the system of arms 3^{1b} again comprises three functional arms 31^{1b}, 32^{1b}, 33^{1b} arranged in series, and, in conjunction with presser devices, said control means also allow

operation of the apparatus from one bead to the other. A base arm (or first arm) 31^{1b} is mounted on an oscillating shaft $3D^{1b}$ via a centre of rotation $31R^{1b}$. The first arm 31^{1b} comprises a conveying head $31T^{1b}$ at the opposite end from the centre of rotation $31R^{1b}$. A second arm 32^{1b}, articulated by a centre of rotation $32R^{1b}$ of the second arm, is mounted on the conveying head $31T^{1b}$ of the first arm 31^{1b}. This second arm 32^{1b} comprises a conveying head $32T^{1b}$. Finally, the apparatus comprises a third arm 33^{1b}, articulated via its centre of rotation $33R^{1b}$ to the conveying head $32T^{1b}$ of the second arm 32^{1b}. This third arm 33^{1b} comprises a conveying head $33T^{1b}$, on which the eyelet 6 is directly mounted.

A drive pulley 311^{1b} is shown centred on the centre of rotation $31R^{1b}$ of said first arm. The drive pulley 311^{1b} is firmly connected to a flange 37^{1b} mounted fixedly on said plate (not shown in Figure 3). A driven pulley 312^{1b} is firmly connected (that is to say without the possibility of any relative rotation) to the second arm 32^{1b}. A toothed belt 361^{1b} connects said drive and driven pulleys. The diameters of the drive pulley and the driven pulley are identical so that, during movement thereof, the second arm 32^{1b} always remains parallel to itself. The person skilled in the art will have understood that, since it is a question of positioning the arm or various arms precisely, the pulleys used are toothed pulleys. The belts, which are also toothed, operate without relative sliding with respect to the pulleys on which they are mounted. It is of course possible to use any equivalent slide-free system to connect the arms whose position has to be controlled, such as for example a chain and pinions. In the present specification, the terms "pulley" and "belt" cover all equivalent systems for slide-free control of the relative positions.

In this example, the flange 37^{1b} is stationary in space but, more generally, it is important for the angular position thereof to be controlled independently of control of the oscillation of said first arm. It is possible, for example, to introduce a degree of freedom between the plate and the flange 37^{1b} and to control the relative position of said flange 37^{1b} relative to the plate, so as to act selectively on the spatial position of the drive pulley 311^{1b} in order, for example, to conform the movement performed by the eyelet 6 to different sized forms.

As far as the means of controlling the relative position of the third arm 33^{1b} relative to the second arm 32^{1b} are concerned, they essentially comprise a drive pulley 321^{1b} centred on the centre of rotation $32R^{1b}$ of said second arm 32^{1b}, firmly connected (no relative rotation possible) with the first arm 31^{1b}, and they comprise a driven pulley 322^{1b} firmly connected (again, no relative rotation possible) with the third arm 33^{1b}. A toothed belt 362^{1b} connects said drive and driven pulleys. The diameters of the drive pulley and the driven pulley are different, their respective values being calculated so that the conveying end $33T^{1b}$, during movement thereof, reaches the zone of the core 1 close to the bead (see Figure 4) without the second arm 32^{1b} striking the sidewall 11 of the core 1.

Figure 4 shows the eyelet 6 in the position 6(a) imposed by the above-described apparatus, at one end of the to-and-fro movement of the functional oscillating arms 31^{1b}, 32^{1b}, 33^{1b}. The corresponding configuration adopted by the second and third arms of the apparatus is shown at 32^{1b}(a) and 33^{1b}(b) respectively. Various other positions and configurations are designated by the reference letters (b), (c), (d).

As a variant, the drive pulley 321^{1b} could also be mounted freely with respect to the first arm 31^{1b} and driven by a belt wound on the one hand around a pulley firmly connected with said drive pulley 321^{1b} and on the other hand wound round another pulley (not shown) concentric with the geometric axis $3D^{1b}$ and motorised independently both of the movement of the first arm and of the movement of the pulley 311^{1b}. This provides more latitude when it comes to controlling the relative movement of the third arm relative to the second.

Figure 5 illustrates an equivalent control means, mounted on the system of oscillating arms 3^{1a} of Figure 1. This Figure shows a third pulley 321^{1a} centred on the intermediate centre of rotation 321^{1a} of said second arm 32^{1a}, firmly connected (no relative rotation possible) with the intermediate arm 34^{1a}, and a fourth pulley 322^{1a} firmly connected (again, no relative rotation possible) with said third arm 33^{1a}. A toothed belt 362^{1a} connects said drive and driven pulleys. The diameters of the drive pulley and the driven pulley are different, their respective values being calculated so that the conveying end $33T^{1a}$, during movement thereof, reaches the zone of the core 1 close to the bead (see Figure 4) without the second arm 32^{1a} striking the sidewall 11 of the core 1. The previous comment about another possibility for controlling the relative movement of the third arm relative to the second also applies to this variant.

Emphasis should also be laid on another detail which is readily visible in Figure 5. In this Figure, the system of arms 3^{1a} is substantially configured as in Figure 1. In this configuration, the second arm 32^{1a} is on one side of the first arm 31^{1a} and the intermediate arm 34^{1a} (and on one side of the median plane defined by the axis MM and the geometric axis of the shaft $3D^{1a}$) and remains on this side during the part of the movement during which the eyelet 6 flies over the half of the core 1 situated on one side of said median plane. During the movement from one side of the core to the other side, the second arm 32^{1a} is caused to pass to the other side of the median plane and, in doing this, to the other side of the first arm 31^{1a} and the intermediate arm 34^{1a}. During the same movement, the intermediate arm 34^{1a} passes over the first arm 31^{1a}. It is thus important for the arms to be correctly superposed so that this movement is possible. This is the role of the distance sleeves 381^{1a} and 382^{1a}. It goes without saying that this comment is of general application. The oscillating arms articulated to each other, insofar as they perform a movement symmetrical in its course relative to a median plane, have to be superposed judiciously relative to one another to allow all the desired crossings of the arms.

With reference to Figures 6 and 7, another variant of the first embodiment will now be explained, said variant again relating to control of the movement of a third arm 33^{1c}. In this further variant of the first embodiment, the system of arms 3^{1c} again comprises three functional arms 31^{1c}, 32^{1c}, 33^{1c} arranged in series, and, in conjunction with presser devices, said control means also allows operation of the apparatus from one bead to the other.

The Figures show a base arm (or first arm) 31^{1c} and a second arm 32^{1c}, a description of the relative movement between the first and second arms being superfluous since it may be identical to that which has been described for the system of arms 3^{1a} or 3^{1b}. The first arm 31^{1c} comprises a conveying head $31T^{1c}$. A second arm 32^{1c}, articulated by a centre of rotation $32R^{1c}$ of the second arm, is mounted on the conveying head $31T^{1c}$ of the first arm 31^{1c}. This second arm 32^{1c} comprises a conveying head $32T^{1c}$. Finally, the apparatus comprises a third arm 33^{1c}, articulated via its centre of rotation $33R^{1c}$ to the conveying head $32T^{1c}$ of the second arm 32^{1c}. This third arm 33^{1c} comprises a conveying head $33T^{1c}$, on which the eyelet 6 is directly mounted. A cam 381^{1c} is machined into the conveying head $31T^{1c}$ of the first arm 31^{1c}. The cam comprises a neutral portion $381N^{1c}$ machined with a constant average radius, a final control portion $381A^{1c}$ with an increasing radius, for controlling the relative movement of the third arm 33^{1c} on one side of the core, and a final control portion $381B^{1c}$ with decreasing radius, for controlling the relative movement of the third arm 33^{1c} on the other side of the core. A toothed wheel 322^{1c} is mounted on the centre of rotation $33R^{1c}$ of the third arm 33^{1c} and is firmly connected (no relative rotation possible) with said third arm 33^{1c}. A connecting rod 383^{1c} slides in a guide 384^{1c} firmly connected with the second arm 32^{1c}. The connecting rod 383^{1c} is thus guided in sliding manner with respect to the second arm 32^{1c}. The connecting rod 383^{1c} carries on one side a cam follower 382^{1c} cooperating with said cam 381^{1c}. On the opposite side from the cam follower 382^{1c}, the connecting rod 383^{1c} comprises a rack 385^{1c} which is engaged on said toothed wheel 322^{1c}. The profile of the cam in the final control portions $381A^{1c}$ and $381B^{1c}$ is selected so that, during movement of the third arm 33^{1c}, the eyelet 6 mounted on the conveying end $33T^{1c}$ of said third arm 33^{1c} reaches the zone of the core 1 close to the bead (see position 6a in Figure 7) without the second arm 32^{1b} striking the sidewall 11 of the core 1.

Figure 7 shows the eyelet 6 in the position 6(a') imposed by the above-described cam apparatus, at one end of the to-and-fro movement of the functional oscillating arms 31^{1c}, 32^{1c}, 33^{1c}. The corresponding configuration adopted by the second and third arms of the apparatus is shown at 32^{1c}(a') and 33^{1c}(a') respectively. Various other positions and configurations are designated by the reference letters (b'), (c'), (d'). By comparing Figures 4 and 7, it will be noted that, if the positions marked (a) and (a') are identical, the positions marked (b'), (c') and (d') in Figure 7 differ somewhat from the positions (b), (c) and (d) in Figure 4. The considerably greater clearance at the level of the sidewall 11 will be noted, said clearance being maintained and permitted by the cam control

means.

Thanks to the cam control, the relative movement between the second and third arms may be fairly freely conformed to requirements since it depends essentially on the profile of the cam. The constraints of proportionality with regard to the relative rotary movement between the first and second arms, specific to the belt control described with reference to Figures 3 and 5, are thus removed. It is possible to impose a relative position of the third arm with regard to the second arm, in particular in order to disengage the eyelet 6 rapidly with respect to the core 1. In this way, a constantly sufficient clearance is ensured between the conveying head $33T^{1c}$ and the core 1 (see positions 6b, 6c and 6d) while moving sufficiently close to the surface of the core 1 in the bead zone (see position 6a). On the cam 381^{1c}, it may be noted that the part $381B^{1c}$, and the part $381D^{1c}$ deflected in the other direction, impose considerable changes in position over only a short distance, i.e. rapid changes in position (travel being in a curvilinear x-direction along the cam 381^{1c}), to tilt the third arm 33^{1c} respectively to one side and the other of the second arm 32^{1c}, at the opposite ends of the movement of the eyelet 6, when it approaches each of the beads.

In a second embodiment, illustrated in Figures 8 and 9, the system of oscillating arms 3^{2a} comprises two functional oscillating arms 31^{2a} and 32^{2a} in series. It is designed for operation from a bead to a shoulder, for example for manufacture of a half-carcass. It is known, in effect, that the carcass of a radial tyre may be discontinuous from one bead to the other, being interrupted somewhere under the tread, the belt reinforcement ensuring the transmission of forces between the half-carcasses. The carcass reinforcement must be deposited between the bead and a shoulder. The oscillating arm system 3^{2a} adopts the parallelogram principle used in the oscillating arm system 3^{1a}, except that, of course, there is no third arm. A plate 30^{2a} supports a control motor 35^{2a}. The control motor 35^{2a} actuates shafts $3D^{2a}$ and $34D^{2a}$, the geometric axis of rotation of which is included in a median plane M^{2a}-M^{2a}. The control motor 35^{2a} also actuates the presser devices 2^{G} and 2^{D}, these being of the same type as those described in more detail in relation to Figure 2. The spacing of the presser devices 2^{G} and 2^{D} relative to the median plane M^{2a}-M^{2a} may be adjusted by wheels 23^{2a} and 24^{2a}.

A base arm (or first arm) 31^{2a} is mounted on the oscillating shaft $3D^{2a}$ via its centre of rotation $31R^{2a}$. Taking as the reference point the centre C of the radial section of the core 1, the centre of rotation $34R^{2a}$ is situated externally of the surface of the core 1. The first arm 31^{2a} comprises a conveying head $31T^{2a}$. A second arm 32^{2a}, articulated by a centre of rotation $32R^{2a}$ of the second arm, is mounted on the conveying head $31T^{2a}$ of the first arm 31^{2a}. This second arm 32^{2a} comprises a conveying head $32T^{2a}$. So as to control the relative position of the second arm 32^{2a} relative to the first arm 31^{2a}, in this example a parallelogram is formed by means of an auxiliary arm 34^{2a}, mounted oscillatingly about the oscillating shaft $34D^{2a}$ via the centre of rotation $34R^{2a}$ thereof.

Taking as the reference point the centre C of the radial section of the core 1, the centre of rotation $34R^{2a}$ is situated externally of the surface of the core 1, between the latter and the centre of rotation $31R^{2a}$ of the first arm 31^{2a}. The auxiliary arm 34^{2a} comprises a conveying head $34T^{2a}$, articulated to the second arm 32^{2a} which comprises to this end an intermediate centre of rotation $32I^{2a}$ situated between the centre of rotation $32R^{2a}$ and the conveying head $32T^{2a}$ of said second arm 32^{2a}. The conveying head $32T^{2a}$ of the second arm 32^{2a} directly supports the eyelet 6. The movement of the eyelet 6 is shown by the axis line 63^{2a}.

An apparatus according to this principle, with two functional oscillating arms, could just as well be used for operation from a bead as far as any point under the tread, including as far as the opposing shoulder, with a certain degree of overlap between the half-carcasses.

Figure 9 shows a variant comprising a system of oscillating arms 3^{2b}, differing from that described in relation to the system of Figure 8 essentially in the means of controlling the movement of the second arm 32^{2b} with regard to the base arm (or first arm) 31^{2b}. Instead of a control means comprising toothed pulleys and belts, this variant comprises a drive pinion 311^{2b} centred on the centre of rotation $31R^{2b}$ of said first arm.

The Figure shows a base arm (or first arm) 31^{2b} mounted on an oscillating shaft via its centre of rotation $31R^{2b}$. The first arm 31^{2b} comprises a conveying head $31T^{2b}$ at the opposite end from the centre of rotation $31R^{2b}$. A second arm 32^{2b}, articulated by a centre of rotation $32R^{2b}$ of the second arm, is mounted on the conveying head $31T^{2b}$ of the first arm 31^{2b}. This second arm 32^{2b} comprises a conveying head $32T^{2b}$, on which the eyelet 6 is directly mounted. The drive pinion 311^{2b} is firmly connected with a flange 37^{2b} mounted fixedly on a plate (not shown in Figure 9). A driven pinion 312^{2b} is firmly connected (that is to say without the possibility of any relative rotation) to the second arm 32^{2b}. A chain 361^{2b} connects said first and second pinions. The diameters of the first and second pinions are identical so that, during movement thereof, the second arm 32^{2b} always remains parallel to itself. The arm system 3^{2b} may replace the arm system 3^{2a} of Figure 8. The above comment about the possibility of controlling a degree of freedom between the plate and the flange 37^{1b} and controlling the relative position of said flange 37^{1b} relative to the plate also applies to the flange 37^{2b}, as well as to all similar flanges.

It should be remembered that the eyelet 6, in all the variants, is actuated with a cyclical movement in a plane, designated above as "the plane of movement". Moreover, the pre-coated surface of the core 1 determines the overall geometry of the surface on which the reinforcing cord 4 is deposited. Furthermore, the core 1 is driven rotationally about its axis while the eyelet 6 performs its to-and-fro movements in the plane of movement of the eyelet. Of course, the movement of the core 1 is synchronised with the to-and-fro movement of the eyelet. The true trajectory of the arches 40 of

the cord 4 is thus both a function of the relative position between the eyelet movement plane and the core and a function of the relative movement between the core 1 and the to-and-fro movement of the eyelet 6.

In Figures 1, 4, 7 and 8, the trajectory of the arch 40 is substantially radial, because said Figures apply to the production of a carcass (or a half-carcass) for a radial tyre, without this being limiting, of course. Another example is given in a third embodiment, illustrated in Figure 12, where the trajectory of the arch 40^{3a} is not radial but rather forms an angle typical of belt reinforcements (of the order of 15° to 30°).

In this third embodiment shown in Figure 12, a system is disclosed which comprises a single functional oscillating arm (the base arm) 31^{3a}, adapted for example to the production of reinforcements in the belt of a tyre. It is adapted, for example, to shoulder to shoulder operation, to produce belt reinforcements. The base arm 31^{3a} is mounted on an oscillating shaft $3D^{3a}$ via its centre of rotation $31R^{3a}$. The base arm 31^{3a} comprises a conveying head $31T^{3a}$, to which an eyelet 6 is directly attached. The plane of movement in which the eyelet 6 describes its to-and-fro movement forms an angle of the order of 20° relative to a plane perpendicular to the axis of rotation of the core 1, according to the conventions usual for measuring angles in the tyre sector. The presser devices 2^{G} and 2^{D} act in the same plane of movement. Among the details visible in Figure 12 which are not specific to this embodiment, it should be noted that the cord 4 is passed through the hollow centre 51^{3a} of the oscillating shaft $3D^{3a}$ and that a large return capacity compensation system 52^{3a} is installed upstream.

To produce a carcass with cross-ply in the sidewalls, the eyelet plane of movement may be changed from a purely radial orientation by inclining the depositing member support (such as the plate 30) about an axis parallel to the axis of rotation of the core 1. It is of course possible to combine this adjustment with that applied in the above paragraph illustrating the production of belt reinforcements. It is also possible, without changing any features of the members of the apparatus as described, to drive the core at a fairly high speed, for example 1/8 of a revolution per to-and-fro movement of the arm system 3, in such a way that a cord laying angle is obtained which is a function of the relationship between the speed of the chain and the speed of the core (whereas in all the preceding examples the speed of the core 1 affected only the laying pitch).

The following comment explains an additional variant, which may be applied to all the embodiments described here, in all the variants thereof. It is possible to impart an alternating movement to the depositing member support (such as the plate 30^{1a} - see Figure 1) with the purpose of deflecting the trajectory of the cord 4 on the core 1. It is possible, for example, to actuate the depositing member support with an alternating translational movement (see double

arrow P in Figure 1), allowing translation of the eyelet plane of movement in a direction perpendicular to the plane of movement. It is also possible to actuate the depositing member support with an oscillatory movement about a geometric axis perpendicular to the surface of the form, included in the plane of movement and intersecting the geometric axis of rotation of the base arm (see double arrow Q about the axis M-M of Figure 1), allowing oscillation of the plane of movement about an axis parallel to said plane of movement. It is also possible to actuate the depositing member support with an oscillatory movement about any axis parallel with the previous one. It is important to distinguish such a design from simple fixed adjustment (also possible and useful in certain cases) of the angle which the plate 30^{1a} forms about the axis MM. All these particular embodiments provide an additional degree of freedom for acting on the exact shape of the trajectory of the cord 4.

An advantage of the invention is that the apparatus thus performing the previously known basic process is mechanically simple and light and that this apparatus involves at most only adjustments which are simple to perform for adaptation to all the tyre reinforcement variants to be produced, covering the widest possible range of tyres. The system of oscillating arms exhibits little protrusion, little inertia and lends itself well to elevated operating speeds.

It is possible to produce a carcass reinforcement in several (n) depositing passes, each pass covering the entire core. Since the radial arches within one pass are laid down at a pitch P, the position on the core 1 of the arches 40 laid down during n successive passes may thus exhibit a circumferential phase shift corresponding to P/n. The person skilled in the art may also foresee a plurality of ways of using the invention, depending on the tyre architecture which it is desired to obtain.

It should also be pointed out that, in the case of the production of half-carcasses (see Figures 8 and 9), it is possible to produce each of the half-carcasses simultaneously each side of the core, by providing two apparatus according to the invention, each opposite one side of the core. Or it is possible to produce each of the half-carcasses in succession.

An advantage of the present invention is that is allows passage round the form in numerous instances of use, including ones in which the trajectory of the arches forms an angle very different from 90° (for example of the order of 20°). Even in this instance, it is also possible to reach two points of the form in succession, each in the zone corresponding to a tyre bead, without the risk of striking the form.

4. Brief Description of Drawings

Figure 1 is a schematic perspective view showing a first embodiment of an apparatus according to the invention;

Figure 2 is a detail of a presser of this apparatus;

Figure 3 illustrates a first variant of the first embodiment;

Figure 4 shows in more detail a stage of operation of the apparatus according to the first embodiment;

Figure 5 illustrates a detail of the first embodiment which is not visible in Figure 1;

Figure 6 illustrates a second variant of the first embodiment;

Figure 7 shows the successive stages of operation of the second variant of the first embodiment;

Figure 8 is a radial section showing a second embodiment of an apparatus according to the invention;

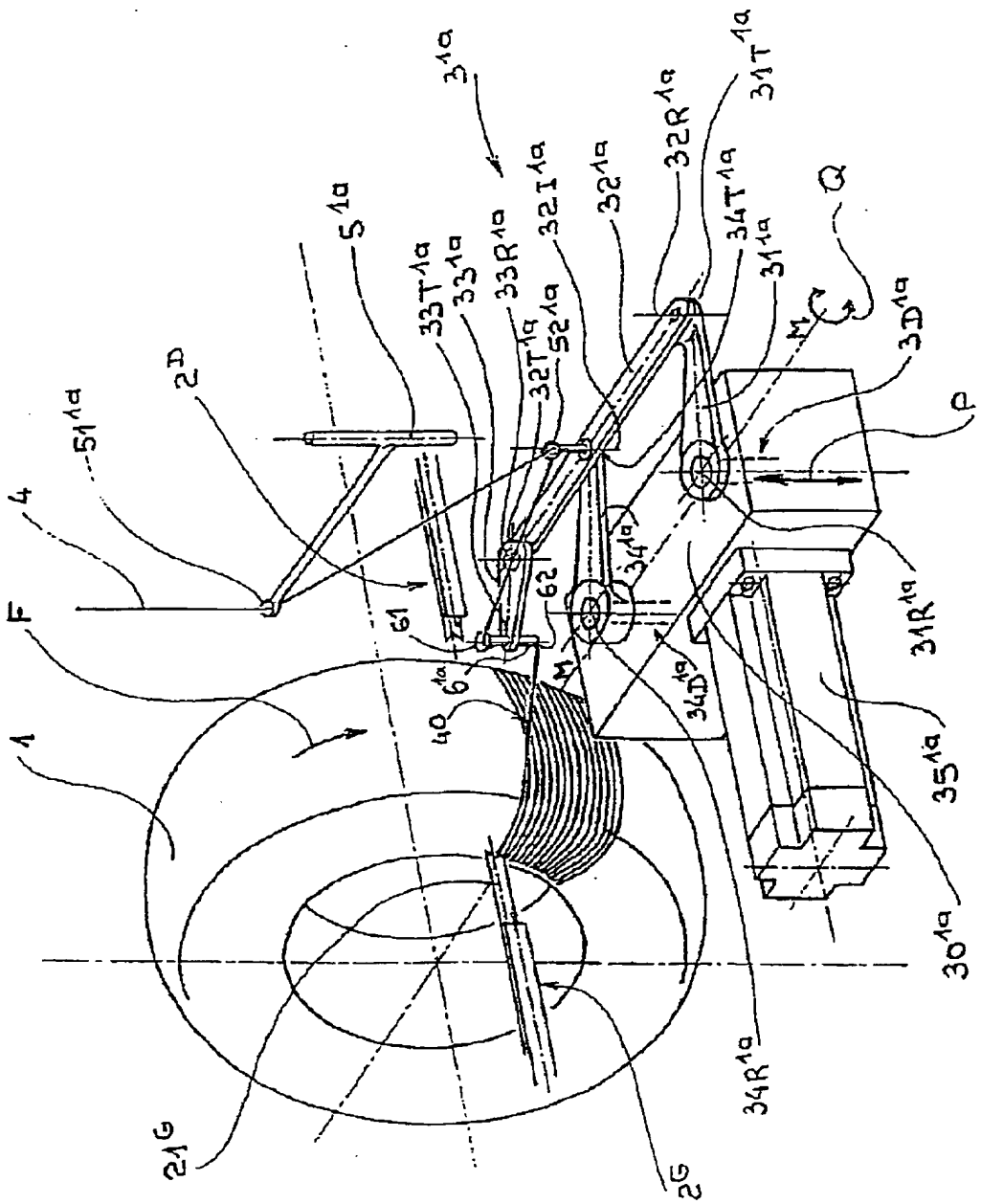
Figure 9 illustrates a variant of the second embodiment;

Figure 10 is an elevational view (section in the plane defined in Figure 1 by the axis MM and the geometric axis of the shaft 3D, also called the "median plane") of the control mechanism used in the first embodiment illustrated in Figure 1;

Figure 11 is a section along AA in Figure 10;

Figure 12 is a schematic perspective view showing a third embodiment of an apparatus according to the invention;

【図１】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Q

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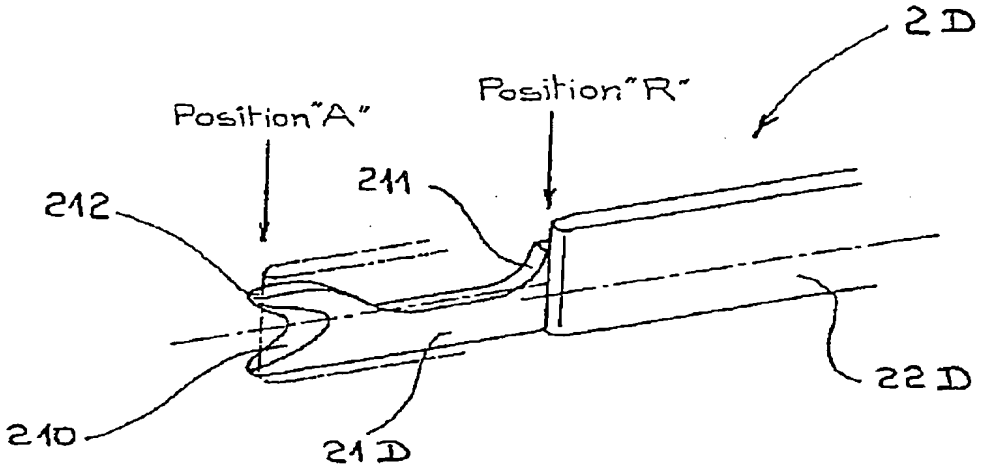
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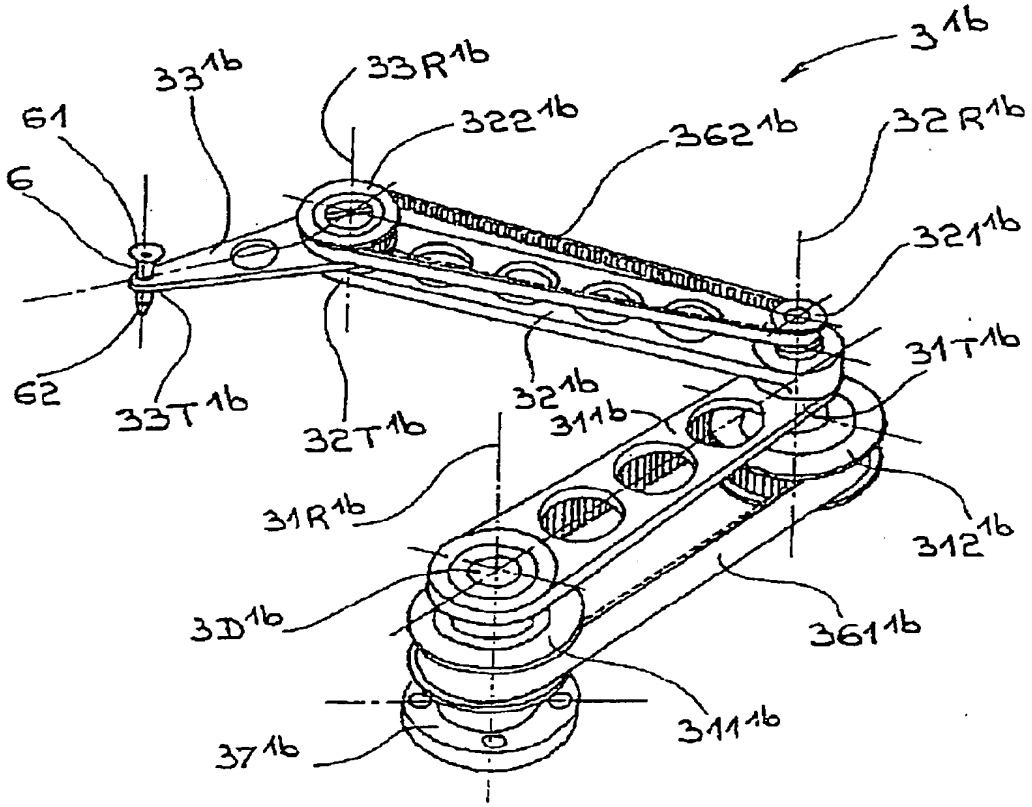
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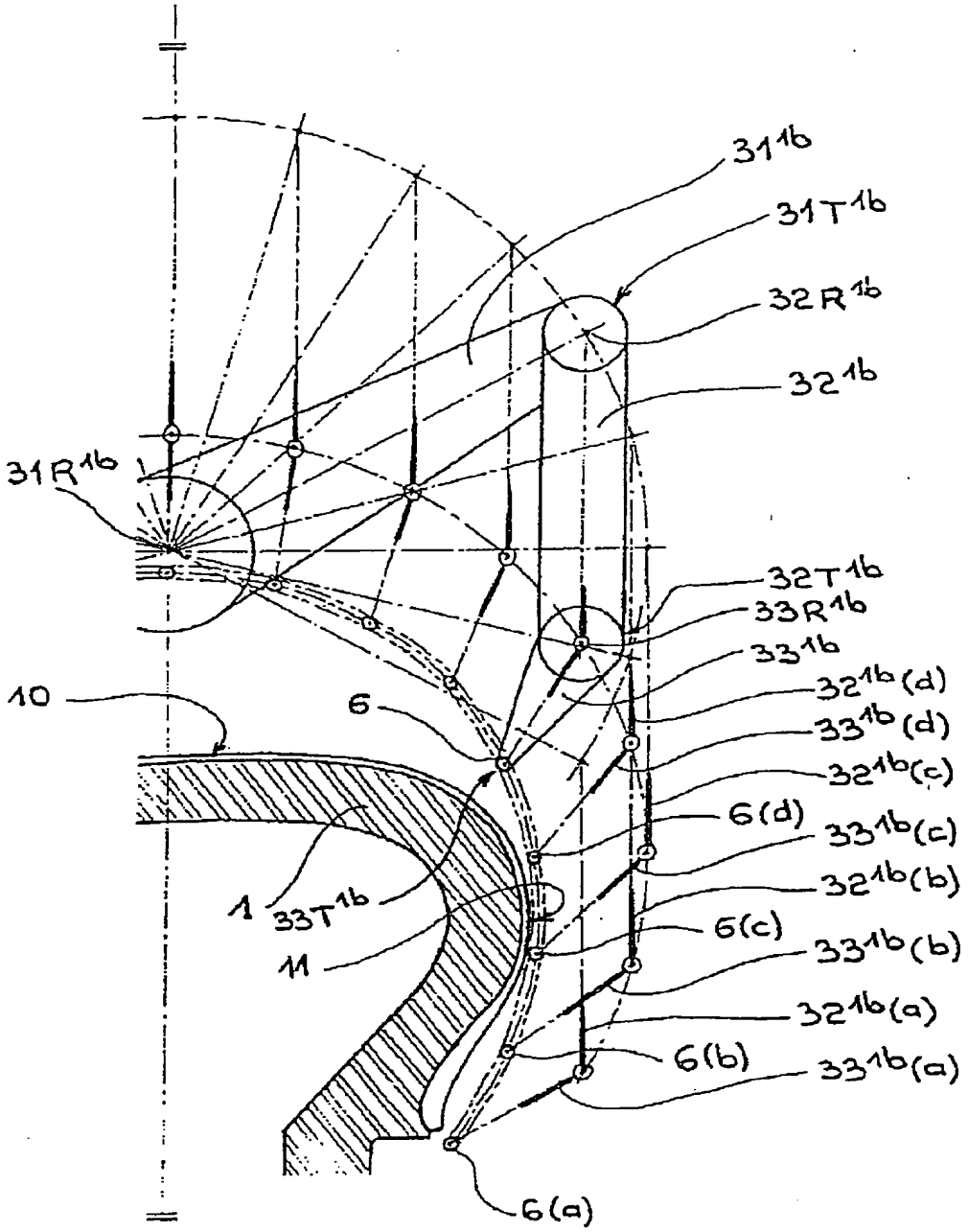
［図４］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6 (d)
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32 1b (b)
6 (c)
33 1b (b)
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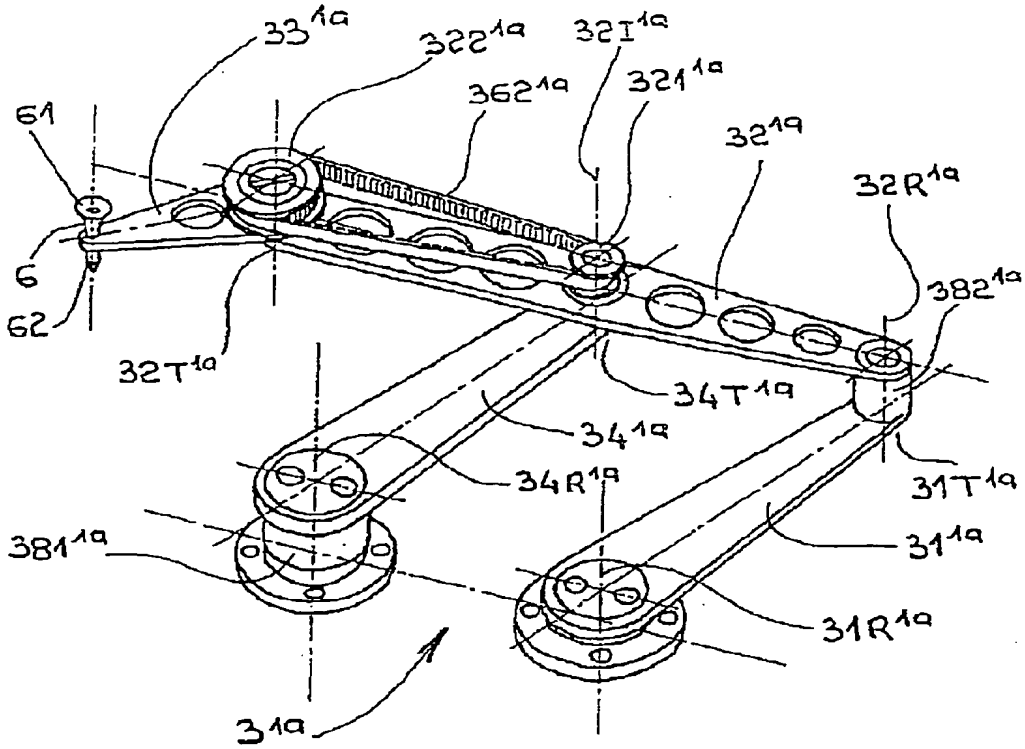
6 (a)

［図５］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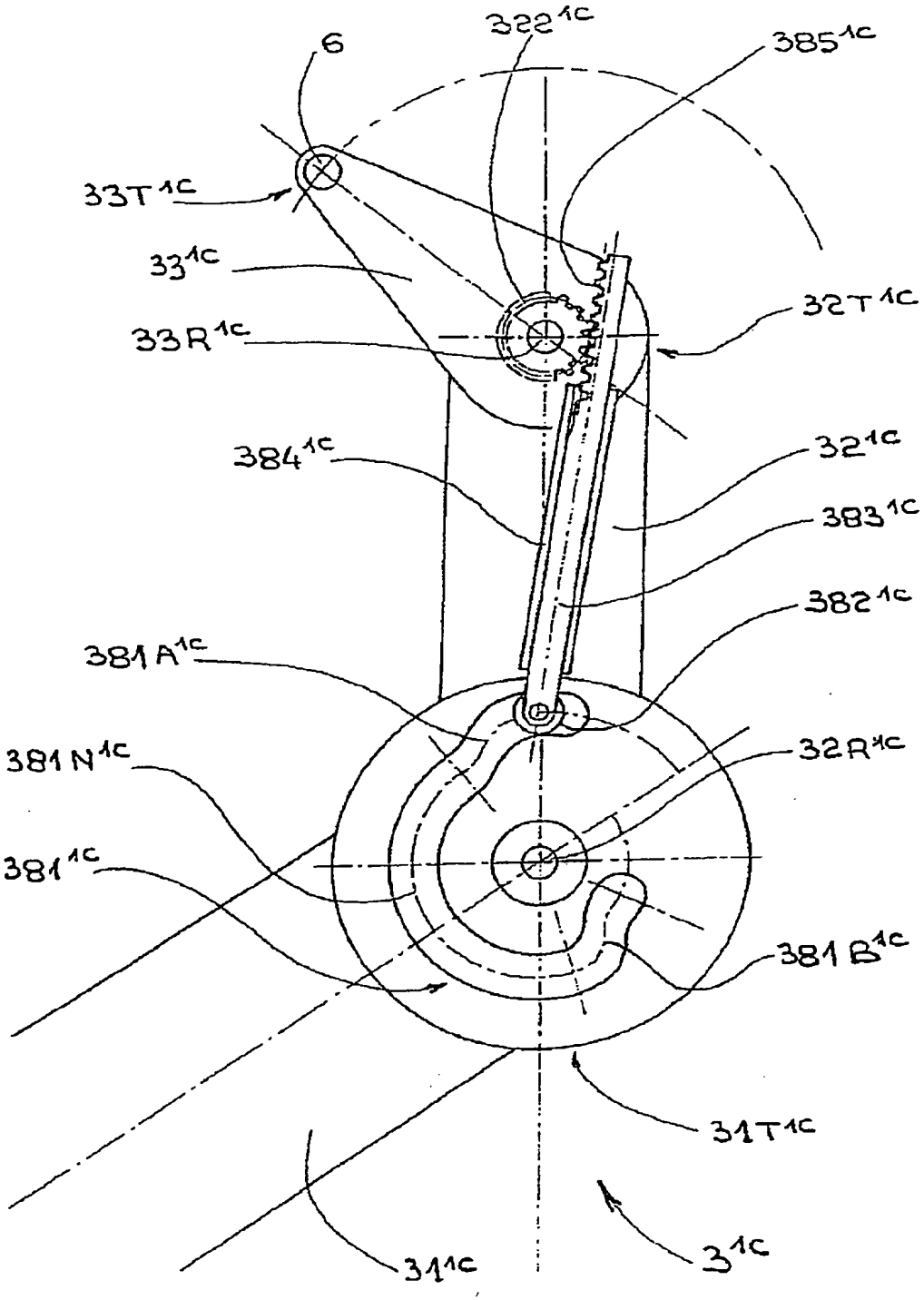
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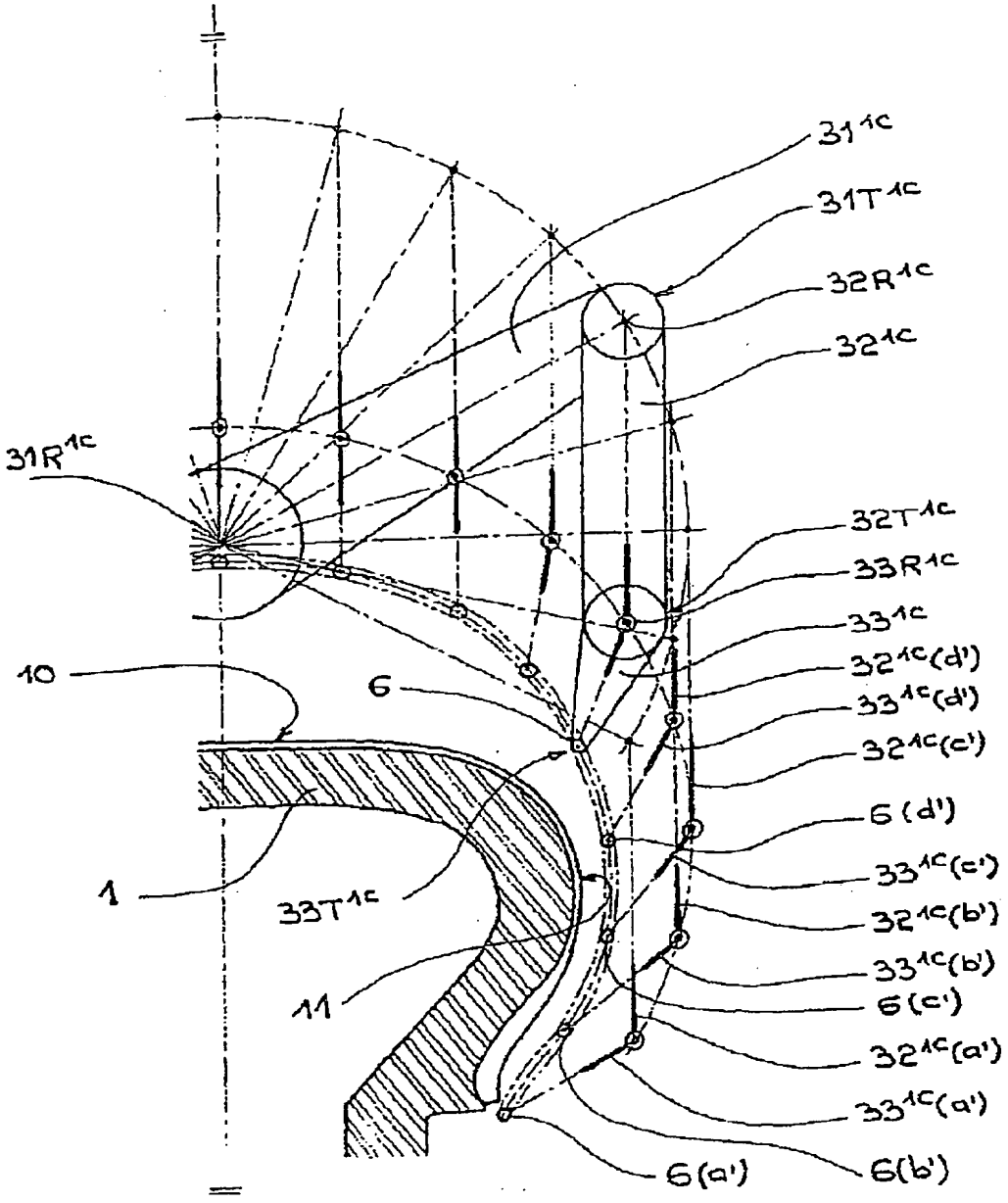
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33^1C(d')
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6(d')
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32^1C(b')
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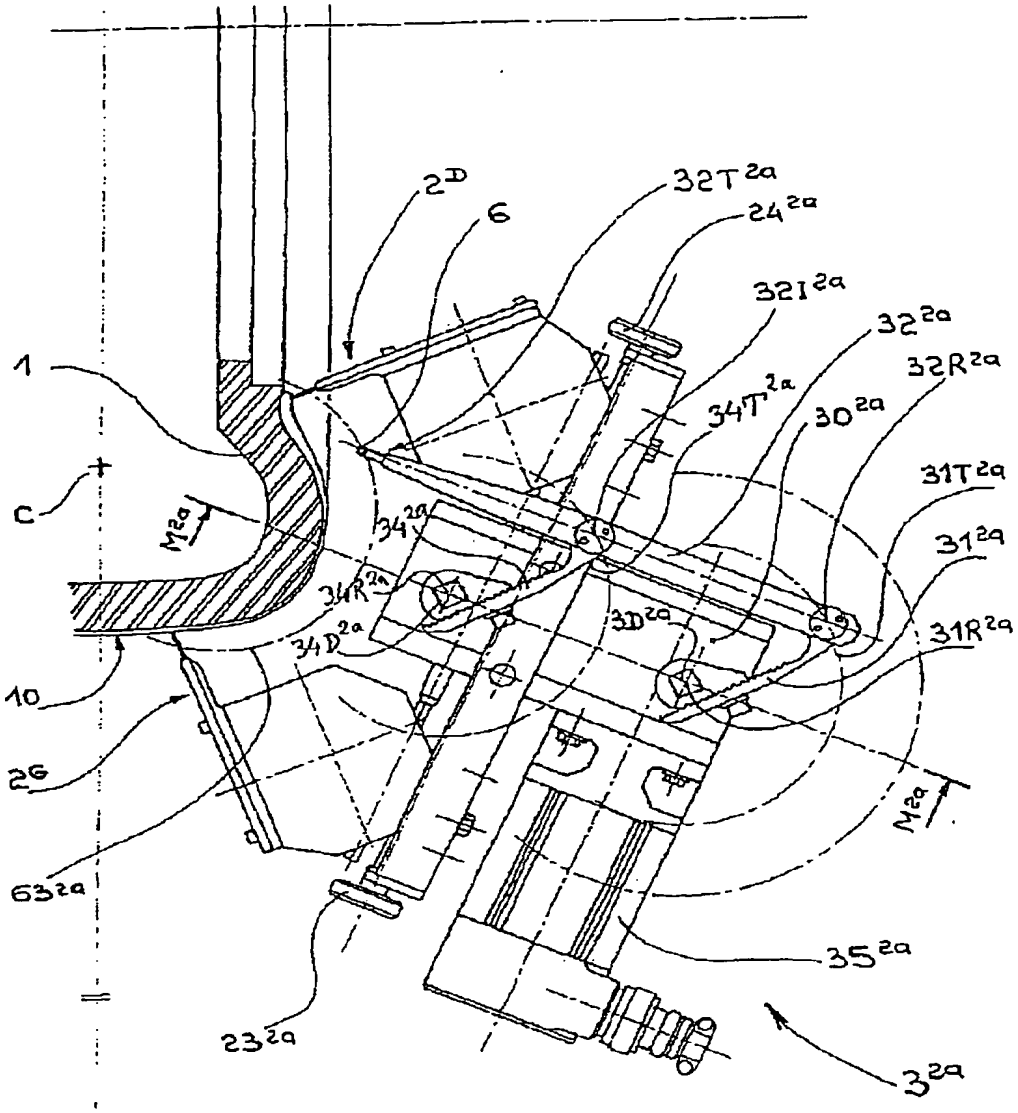
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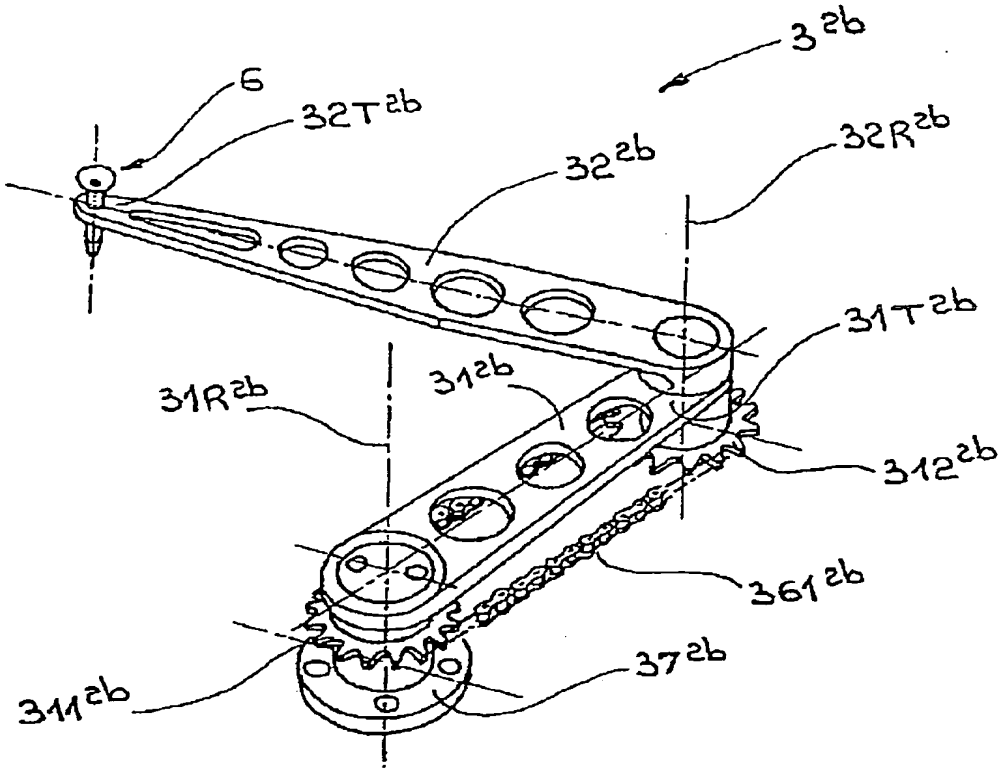
〔図９〕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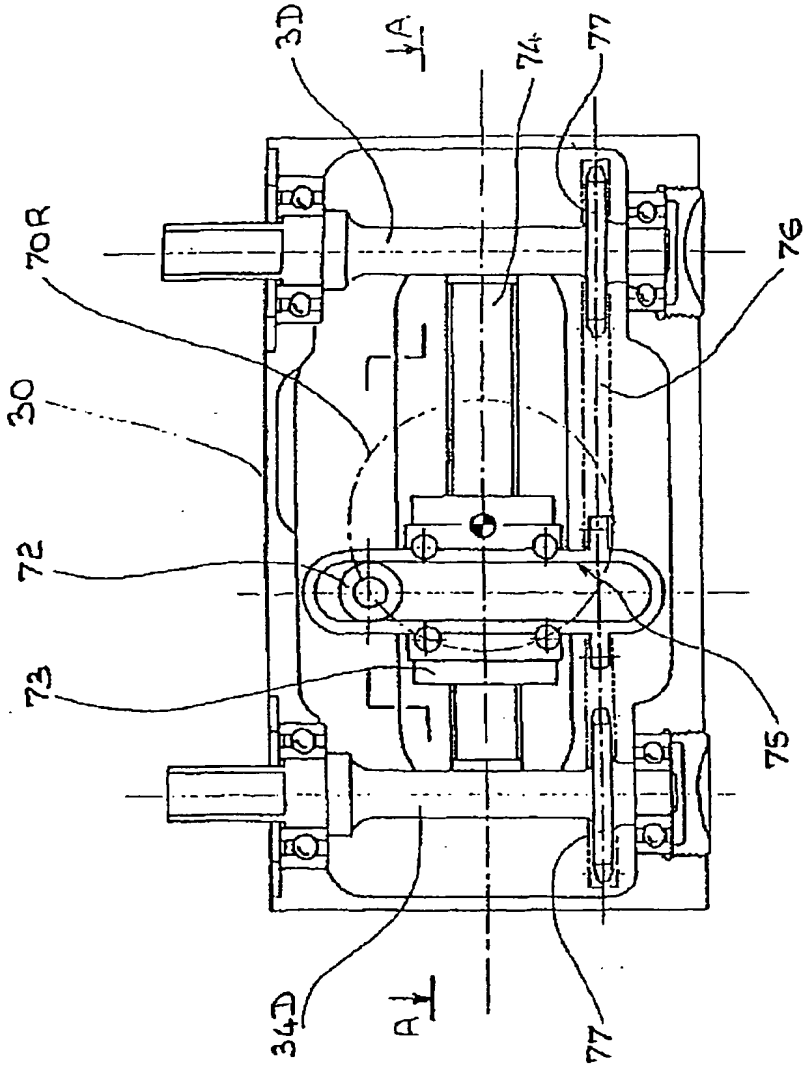
〔図１０〕



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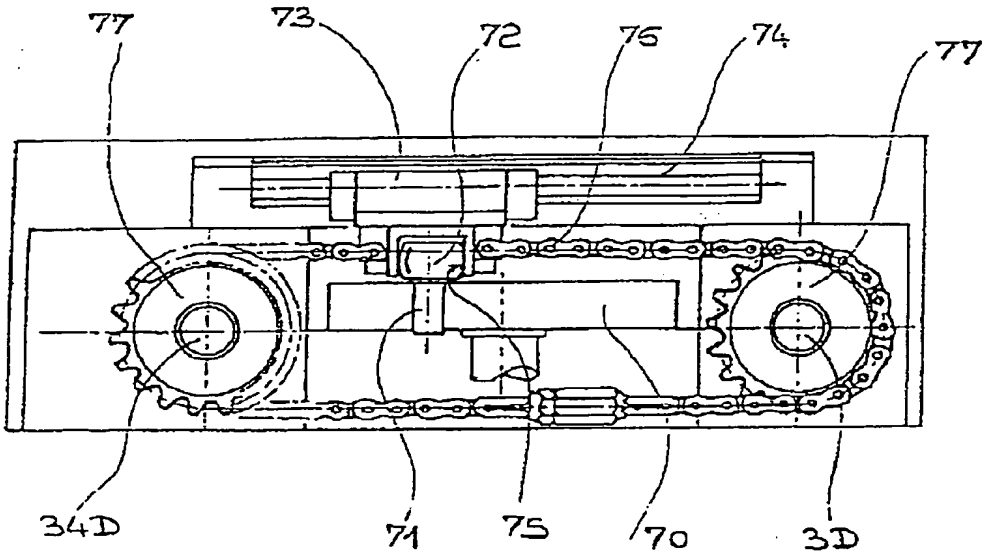
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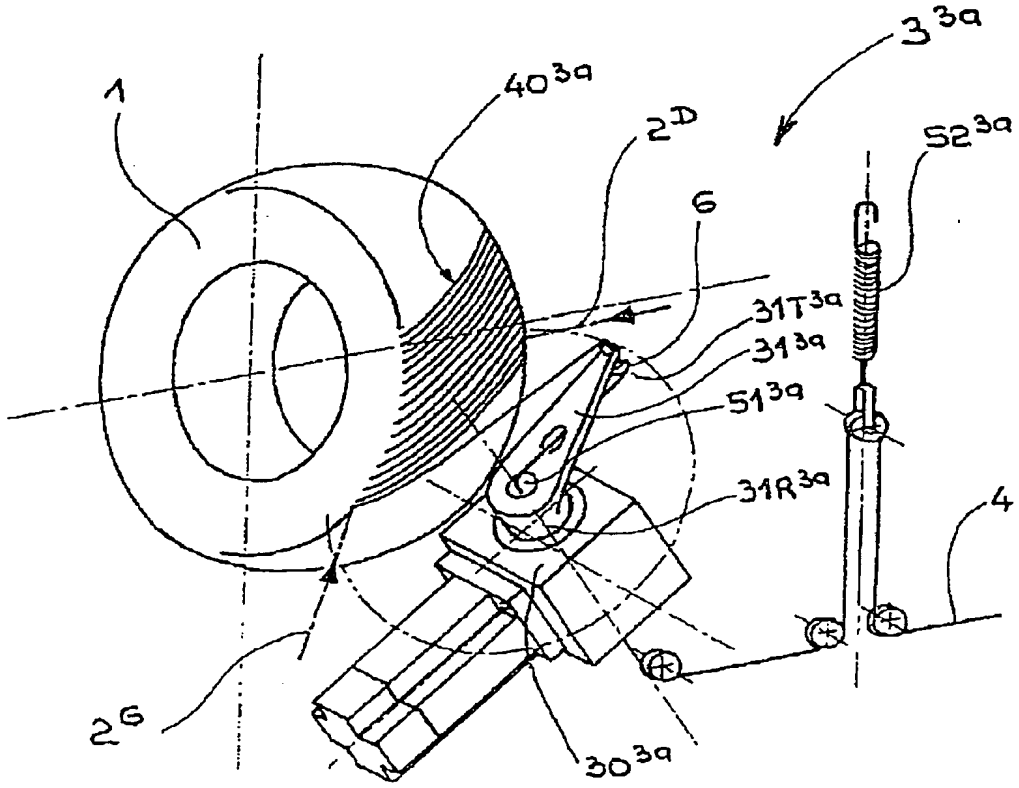
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2G
30 3a

1. Abstract

The cord 4, intended to constitute a carcass reinforcement, is deposited in contiguous arches on a rigid core 1 by a system of arms arranged in series conveying an eyelet 6 in such a way as to allow it to fly over a core 1 and thus deposit adjacent arches.

2. Representative Drawings

Figure 1